Atty. Docket No. KOV-004

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF: :

Klaus Kunze et al. : GROUP ART UNIT: 2822

APPLICATION NO: 10/616,147 :

FILED: July 8, 2003 : EXAMINER: TRINH, Michael Manh

FOR: COMPOSITIONS AND METHODS FOR FORMING A SEMICONDUCTING AND/OR SILICON-CONTAINING FILM, AND STRUCTURES FORMED THEREFROM

I hereby certify that this document is being electronically or facsimile transmitted to the USPTO or deposited with the United States Postal Service as first class mail in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on July 31, 2008.

By: /Kristen Irwin/
Kristen Irwin

PETITION TO WITHDRAW ELECTION OF SPECIES REQUIREMENT UNDER 37 C.F.R. 1.181

Mail Stop PETITION
COMMISSIONER FOR PATENTS
P.O. BOX 1450
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SIR:

In the interests of justice, Applicant's undersigned representative respectfully requests withdrawal of the election of species requirement and the constructive withdrawal of Claims 96-110, 113-124, 126-134, 139-159 and 173-203 as set forth in the final Office Action dated May 30, 2008 in the above-identified application. Additional facts are as follows:

1. In the Office Action dated June 7, 2006, the Examiner required restriction to one of the following Groups:

Group I: Claims 1-25, drawn to a composition, classified in Class 106, subclass 287.1.

Group II: Claims 26-40, drawn to an ink composition for making a semiconductor film, classified in Class 106, subclass 285.

Group III: Claims 41-65, drawn to a method of making a patterned semiconductor film, by printing a composition and curing the composition, classified in Class 427, subclass 397.7.

Group IV: Claims 66-78, drawn to a method for forming a semiconductor film, at least by partially curing a thin film composition comprising semiconductor nanoparticles to form a semiconductor thin film lattice and coating it with a composition, classified in Class 427, subclass 397.7.

Group V: Claims 79-86, drawn to a method for forming a semiconductor film, by coating an at least partially cured thin film composition with an ink, classified in Class 427, subclass 397.7.

Group VI: Claims 87-91, drawn to a semiconductor thin film structure comprising a sintered mixture of passivated semiconductor particles in a hydrogenated and at least partially amorphous Group IVA element, classified in Class 428, subclass 403.

2. A copy of the Office Action dated June 7, 2006 is attached as Exhibit A.

3. On June 26, 2006, Applicants elected Group III, Claims 41-65, drawn to a method of making a patterned semiconductor film, without traverse. A copy of the Response to Restriction Requirement dated June 26, 2006 is attached as Exhibit B.

4. In the final Office Action dated March 12, 2007, the Examiner constructively elected species recited in base Claim 41 and new Claims 111-112, 125, 135-138 and 160-164,

withdrawing Claims 96-110, 113-124, 126-134 and 139-159 as being drawn to a non-elected invention. No clear definition of the constructively elected species was provided therein, nor was any description of the constructively non-elected species/invention provided at all. A copy of the final Office Action dated March 12, 2007, which includes the withdrawal of Claims 96-110, 113-124, 126-134 and 139-159 is attached as Exhibit C.

5. In the Office Action dated March 12, 2007, only conclusory statements that withdrawn Claims 96-110, 113-124, 126-134 and 139-159 contain patentably distinct species were provided. Specifically, the Examiner stated: "Newly added claims 96-164 are directed to a plurality of the patentably distinct species of the claimed invention… Other species as recited in remaining claims 96-110, 113-124, 126-134 and 139-159 are withdrawn from consideration as being directed to a non-elected invention." No other characterization, explanation or description of constructively withdrawn claims 96-110, 113-124, 126-134 and 139-159 or the subject matter therein or thereof was provided.

6. In the Office Action dated March 12, 2007, the Examiner did not state what the "other species" are, nor did the Examiner provide any reason, example or explanation as to why the "other species" are patentably distinct.

7. *Claims themselves are never species*. M.P.E.P. 806.04(e), emphasis in original. Consequently, Applicants are unable to determine what the "other species" are, or why they might be considered patentably distinct.

8. On June 11, 2007, Applicants responded to the final Office Action dated March 12, 2007 with an Amendment that included a traversal of the apparent election of species requirement and constructive withdrawal of Claims 96-110, 113-124, 126-134 and 139-159, on the basis that the constructively withdrawn dependent claims depend from the constructively elected independent Claim 41. According to M.P.E.P. 806.05(c)(II), restriction must not be made where the relationship between the claims is such that the separately claimed subcombination B(sp) constitutes the essential distinguishing feature of the combination AB(sp) as claimed. Therefore, restriction between an independent claim (i.e., subcombination B(sp))

and a claim depending therefrom (combination AB(sp)) is not proper. A copy of Applicants' Amendment dated June 11, 2007 is attached as Exhibit D.

9. The Examiner maintained the election of species and the withdrawal of Claims 96-110, 113-124, 126-134 and 139-159 in the Office Action dated August 27, 2007. A copy of the Office Action dated August 27, 2007 is attached as Exhibit E.

10. On January 22, 2008, Applicants filed an Amendment amending Claim 41 adding new Claims 165-205. Claims 173-201 and 203 depend directly or indirectly from independent Claim 166 (which was not restricted), and Claim 202 depends from Claim 41 (the apparent constructively elected species). A copy of the Amendment filed January 22, 2008 is attached as Exhibit F.

11. In the final Office Action dated May 30, 2008, the Examiner constructively withdrew Claims 173-203 on the basis that they are drawn to subject matter similar to that of non-elected Claims 96-110, 113-124, 126-134 and 139-159. No other characterization, explanation or description of constructively withdrawn Claims 173-203 (or of constructively withdrawn Claims 96-110, 113-124, 126-134 and 139-159) or the subject matter therein or thereof was provided. A copy of the final Office Action dated May 30, 2008, which includes the constructive withdrawal of Claims 173-203, is attached as Exhibit G.

12. Again, in the constructive withdrawal of Claims 173-203 in the final Office Action dated May 30, 2008, the Examiner failed to provide any reason, example or explanation as to why the constructively withdrawn claims are patentably distinct.

13. Where inventions as disclosed and claimed are both (A) species under a claimed genus and (B) related, then the question of restriction must be determined by both the practice applicable to election of species and the practice applicable to other types of restrictions such as those covered in M.P.E.P. § 806.05 - § 806.05(j). If restriction is improper under either practice, it should not be required. See M.P.E.P. § 806.04.

14. As explained above, according to M.P.E.P. 806.05(c)(II), restriction between an independent claim (i.e., subcombination B(sp)) and a claim depending therefrom (combination AB(sp)) is not proper.

15. The Examiner therefore cannot demonstrate patentable distinctness for any of the constructively withdrawn Claims 96-110, 113-124, 126-134, 139-159 and 173-203, as they cannot be properly restricted from the independent Claims from which they depend, and the Examiner failed to identify any no "other species," much less provide a reason, example, or explanation as to why they are patentably distinct. Thus, the Examiner has not met the criteria for requiring an election of species as set forth in M.P.E.P. §§ 806.04 and 806.05(c)(II).

16. In the interests of justice, Applicant's undersigned representative respectfully requests the withdrawal of the election of species requirement as explained above.

17. Additional facts in support of this Petition may be provided on request.

Early notice of any decision by the U.S. Patent and Trademark Office to grant the relief requested in paragraph 15 above is respectfully requested.

Respectfully submitted,

/Andrew D. Fortney/

Andrew D. Fortney, Ph.D.
Reg. No. 34,600

401 W. Fallbrook Avenue, Suite 204
Fresno, California 93711
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ADF:web

# EXHIBIT A

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
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www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/616,147 | 07/08/2003 | Klaus Kunze | KOV-004 | 2078 |

36872 7590 06/07/2006

THE LAW OFFICES OF ANDREW D. FORTNEY, PH.D., P.C.
401 W FALLBROOK AVE STE 204
FRESNO, CA 93711-5835

| EXAMINER | |
|---|---|
| TRINH, MICHAEL MANH | |
| **ART UNIT** | **PAPER NUMBER** |
| 2822 | |

DATE MAILED: 06/07/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/616,147 | KUNZE ET AL. | |
| | Examiner | Art Unit | |
| | Michael Trinh | 2822 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 1 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *08 July 2003*.

2a)☐ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-91* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☐ Claim(s) _____ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☒ Claim(s) *1-91* are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

**Part III DETAILED ACTION**

*** This office action is in response to filling of the Application on July 08, 2003. Claims 1-91 are pending.

***Election/Restriction***

1. Restriction to one of the following inventions is required under 35 U.S.C. § 121:

I. Claims 1-25,26-40, drawn to a composition, classified in class 106 subclass 287.1.

II. Claims 26-40, drawn to an ink composition for making a semiconductor film 106/285.

III. Claims 41-65, drawn to a first method of making a patterned semiconductor film, by printing a composition and curing the composition, class 427/397.7

IV. Claims 66-78, drawn to a second method for forming a semiconductor film, at least by partially cured thin film composition comprising semiconductor nanoparticles to form a semiconductor thin film lattice and coating it with a composition.

V. Claims 79-86, drawn to a third method for forming a semiconductor film, by coating the at least partially cured thin film composition with an ink.

VI. Claims 87-91, drawn to a semiconductor thin film structure comprising a sintered mixture of passivated semiconductor particles in a hydrogenated, and at least partially amorphous Group IVA element, 428/403.

The inventions of Group I to Group VI are distinct and species as shown above.

Inventions III-V and VI are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (M.P.E.P. § 806.05(f)). Unpatentability of the group III-V invention would not necessarily imply unpatentability of the group invention, since the device of the group VI invention could be made by process material different than those/that of the group III-V invention. For example: instead of partially curing the thin film composition, a semiconductor film structure can be formed by completely curing the thin film composition. Currently, there is no generic claim for Group III, Group IV, and Group V.

Because these inventions are distinct for the reasons given above and have acquired a separate status as given in the above and as shown above by the above different classifications, the fields of search are not co-extensive and separate examination would be required, restriction for examination purposes as indicated is proper.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the

currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a petition under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

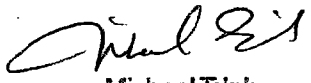
**********

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael M. Trinh whose telephone number is (571) 272-1847. The examiner can normally be reached on M-F: 9:00 Am to 5:30 Pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra Smith can be reached on (571) 272-2429. The central fax phone number is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Oacs-



Michael Trinh
Primary Examiner

# EXHIBIT B

COPY

Atty. Docket No. KOV-004

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

| | |
|---|---|
| IN RE APPLICATION OF: | : |
| Klaus KUNZE et al. | : GROUP ART UNIT: 2822 |
| APPLICATION NO: 10/616,147 | : |
| FILED: July 8, 2003 | : EXAMINER: Trinh, Michael |

FOR: COMPOSITIONS AND METHODS FOR FORMING A SEMICONDUCTING AND/OR SILICON-CONTAINING FILM, AND STRUCTURES FORMED THEREFROM

I hereby certify that this document is being facsimile transmitted to the USPTO or deposited with the United States Postal Service as first class mail in an envelope addressed to Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on June 26, 2006 .

By: _____
Amanda Tout

RESPONSE TO RESTRICTION REQUIREMENT UNDER 35 U.S.C. 121 AND 37 C.F.R. 1.142

MAIL STOP AMENDMENT
COMMISSIONER FOR PATENTS
P.O. BOX 1450
ALEXANDRIA, VA 22313-1450

SIR:

Responsive to the Office Action and Requirement for Restriction dated June 7, 2006, Applicant elects Group III, Claims 41-65, drawn to a method of making a patterned semiconductor film, by printing a composition and curing the composition, without traverse.

## Remarks

The Examiner has required restriction of the claims as follows:

1. Group I: Claims 1-40, drawn to a composition, classified in Class 106, subclass 287.1.

2. Group II: Claims 26-40, drawn to an ink composition for making a semiconductor film, classified in Class 106, subclass 285.

3. Group III: Claims 41-65, drawn to a method of making a patterned semiconductor film, by printing a composition and curing the composition, classified in Class 427, subclass 397.7.

4. Group IV: Claims 66-78, drawn to a method for forming a semiconductor film, at least by partially curing a thin film composition comprising semiconductor nanoparticles to form a semiconductor thin film lattice and coating it with a composition, classified in Class 427, subclass 397.7.

5. Group V: Claims 79-86, drawn to a method for forming a semiconductor film, by coating an at least partially cured thin film composition with an ink, classified in Class 427, subclass 397.7.

6. Group VI: Claims 87-91, drawn to a semiconductor thin film structure comprising a sintered mixture of passivated semiconductor particles in a hydrogenated and at least partially amorphous Group IV A element, classified in Class 428, subclass 403.

Applicant has elected Group III, Claims 41-65, drawn to a method of making a patterned semiconductor film, without traverse. Claims 1-40 and 66-91 are now believed to be withdrawn from consideration as being drawn to non-elected Groups.

Conclusions

In view of the above election and remarks, Claims 41-65 are in condition for examination on the merits. Early notice to that effect is earnestly requested.

If it is deemed helpful or beneficial to the efficient prosecution of the present application, the Examiner is invited to contact Applicant's undersigned representative by telephone.

Respectfully submitted,

Andrew D. Fortney, Ph.D.
Reg. No. 34,600

401 W. Fallbrook Avenue, Suite #204
Fresno, California 93711-5835
(559) 432 – 6847

ADF:gmm

# EXHIBIT C

UNITED STATES PATENT AND TRADEMARK OFFICE

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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/616,147 | 07/08/2003 | Klaus Kunze | KOV-004 | 2078 |

36872 7590 03/12/2007

THE LAW OFFICES OF ANDREW D. FORTNEY, PH.D., P.C.
401 W FALLBROOK AVE STE 204
FRESNO, CA 93711-5835

| EXAMINER | |
|---|---|
| TRINH, MICHAEL MANH | |
| ART UNIT | PAPER NUMBER |
| 2822 | |

| SHORTENED STATUTORY PERIOD OF RESPONSE | MAIL DATE | DELIVERY MODE |
|---|---|---|
| 3 MONTHS | 03/12/2007 | PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/616,147 | KUNZE ET AL. | |
| | Examiner | Art Unit | |
| | Michael Trinh | 2822 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *08 December 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *41-46,51,53-54,56-65,96-164* is/are pending in the application.

4a) Of the above claim(s) *96-110,113-124,126-134 and 139-159* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *41-46,51,53,54,56-65,111,112,125,135-138 and 160-164* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

**DETAILED ACTION**

*** This office action is in response to Applicant's Amendment filed December 08, 2006. Claims 41-46,51,53-54,56-65, 96-164 are pending, in which claims 96-164 have been newly added.

*** The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

***Election/Restrictions***

1. Newly added claims 96-164 are directed to a plurality of the patentably distinct species of the claimed invention. Generic base claim 41 is amended to recite the semiconductor film comprising an array of lines having a width, a length, and a thickness. Since applicant has received an action on the merits for the originally presented invention at least of subject matter of inkjet printing (e.g. claim 56) and both of first and second cyclic (e.g. claim 45), including the species of having an array of lines having a width, a length, and a thickness as recited in base claim 41, in which generic base claim 1 is amended to recite the array of lines having a dimension of a width of from 100nm to 100μm, a length of from 1-5000μm, and a thickness of from 0.01-1000 μm. Species as recited in newly added claims 160-164 and claims 111-112,125,135-138,160-164 for dimensions, inkjet printing, first and second cyclic have been constructively elected by original presentation, together with currently presentation in base generic claim 41 having semiconductor film comprising an array of lines having a width, a length, and a thickness, and examination for prosecution on the merits. Other species as recited in remaining claims including 96-110,113-124,126-134,139-159 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03. Should applicant traverse on the ground that the species are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the species to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other invention. Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to *additional species which are written in dependent form or otherwise include all the limitations of an allowed generic*

*claim as provided by 37 CFR 1.141.* If claims are added after the election, applicant must indicate which are readable upon the elected species. MPEP § 809.02(a).

Accordingly, Claims 96-110,113-124,126-134,139-159 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b).

***Claim Rejections - 35 USC § 103***

2. Claims 41-46,56-61,62-65,111-112,125,160-164, are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiho et al (2003/0045632) taken with Kim et al (6,355,198) and Jacobson (6,294,401).

Shiho teaches (at paragraphs 38-93) a method for making a semiconductor film comprising at least the steps of: a) printing a composition by inkjet printing, offset printing , screen printing (paragraph 0110) to form the composition comprising a first cyclic Group IVA compound of the formula SinRm , n is an integer of 3 or more and m is integer of 2n+2, wherein $Si_nH_{2n+2}$ is mentioned at paragraph 44, wherein dopants of B, P, and As with at least alkyl group are mentioned at paragraphs 76-82, which is corresponding to claimed formula (1):(AHx )n, where n is from 3 to 8 and each A in the formula is independently Si, and/or a second cyclic Group IVA compound of the formula (2):(AHx)m(AHyRzy)p(ZR')q, (2) where (m+p+q) is from 3 to 12, each of the m instances of x is independently 0, 1 or 2, each of the p instances of y is independently 0, 1 or 2, each of the p instances of z is independently 0, 1 or 2, each of the p instances of (y+z) is independently 1 or 2, each of the q instances of w is independently 0 or 1, at least one of p and q is at least 1, each A in the formula (2) is independently Si, Z is selected from the group consisting of B, P and As, R' is R or H, and each R in the formula (2) is independently alkyl, aryl, aralkyl, a halogen, BHsR"2s, PHsR"2-s, AsHR"2-s or AHtR".sub.3-t, where s is 0 to 2, t is 0 to 3, and R" is alkyl, aryl, aralkyl, a halogen, or AH3, and a solvent (paragraphs 0102-0103) in a film on a substrate; and b) curing said printed composition to form said semiconductor film (paragraphs 117,120,137,138), wherein curing the printed composition comprises irradiating the printed composition (paragraphs 138,,113,137,120), wherein the semiconductor film comprising a film particularly preferably having a thickness of 0.01 to 5 microns (paragraphs 0110). Re claims 42-44, wherein the composition comprises semiconductor

silicon nanoparticles (paragraphs 60-64) and passivated as the silicon particles are dispersed in the silane composition. Re claims 45,111-112, wherein the composition including both first and second cyclic group IVA compound of silicon and dopants of B, P, As (at paragraphs 38-93), herein $Si_nH_2n_{+2}$ is mentioned at paragraph 44, wherein dopants of B, P, and As with at least alkyl group are mentioned at paragraphs 76-82. Re claims 46,58 wherein curing by heating so as to sintering the semiconductor film so as to dry the semiconductor film (paragraphs 117,120,137-138), wherein curing comprises irradiating the composition (paragraphs 120,138). Re claims 58-59, 125, wherein curing by heating so as to sintering the semiconductor film so as to dry the semiconductor film at a temperature at least about 200°C (paragraphs 117,120,137-138), wherein sintering temperature is at least about 300°C (paragraphs 117,120,137-138). Re claims 60-61, wherein the curing heat treatment is evacuated so as to treat in an inert argon gas or reducing hydrogen gas in chamber, inherently (paragraphs 117, 137).

Re claim 41, Shiho already teaches inkjet printing a semiconductor film having a thickness, particularly preferably of 0.01 to 5μm (paragraph 0110), while claim 41 recites an array of lines having a width of from 100nm to 100μm, a length of from 1 to 5000μm , and a thickness of from 0.01 to 1000 μm, and lacks forming the semiconductor film as a patterned semiconductor film by gravure printing.

However, , Kim teaches (at Figs 1,15,16; col 34, lines 13-50) printing and curing a composition to form an array of lines having a typical width of from 1μm to 10μm, a length of from 100μm , and a thickness as similar to a width and spacing of from 1μm to 10μm (re further claims 41,62-65,160-164). Jacobson teaches (at col 5, lines 34-60; col 3, lines 36-43) printing semiconductor nanoparticles to form a patterned semiconductor film on a substrate by using any of variety including spin coating, casting, screen printing, stamping, etc, wherein the patterned semiconductor film is used in forming a thin film transistor, wherein printing by ink jetting the composition with solvent (re further claim 56, col 5, lines 34-45, col 6, lines 1-10; col 4, lines 13-15), wherein by screen printing process, the composition with solvent is inherently deposited on the substrate through stencil on or over the substrate, wherein the printing of the composition with solvent includes screen printing, gravure printing, lithography (re claim 57).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the semiconductor film of Shiho as an array of lines of a patterned

semiconductor film having a typical width of from 1μm to 10μm, a length of from 100μm , and a thickness as similar to a width of from 1μm to 10μm by inkjet printing, gravure printing, offset printing, as taught by Kim and Shiho above. This is because of the desirability to form an array of lines of patterned semiconductor films having a desired dimensions on the substrate, and for used in manufacturing a plurality of semiconductor device. Additionally, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the semiconductor film of Shiho as a patterned semiconductor film by inkjet printing, Gravure printing, offset printing, screen printing, spin coating, etc., as taught by Jacobson and Shiho above. This is because of the desirability to form patterned semiconductor films on desired and selected portions of the substrate in forming a plurality of semiconductor thin film transistors by using a variety of printing processes.

The subject matter as a whole would have been obvious to one or ordinary skill in the art at the time the invention was made to select the portion of the prior art's range of thickness, as taught by Kim and Shiho, which is within the range of applicant's claims, because it has been held to be obvious to select a value in a known range by optimization for the best results, and would be an unpatentable modification, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation". *In Re Aller* 104 USPQ 233,255 (CCPA 1955); *In re Waite* 77 USPQ 586 (CCPA 1948); *In Re Swanson* 56 USPQ 372 (CCPA 1942); *In Re Sola* 25 USPQ 433 (CCPA 1935); and *In Re Dreyfus* 24 USPQ 52 (CCPA 1934).

3. Claims 51,53-54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiho et al (2003/0045632), Kim et al (6,355,198) and Jacobson (6,294,401), as applied to claims 41-46,56-61,62-65,111-112,125,160-164 above, and further of Tani et al (5,254,439).

The references including Shiho, Kim and Jacobson teach a method for making a semiconductor film as applied to claims 41-46,56-61,62-65,111-112,125,160-164 above. Jacobson teaches (at col 5, lines 34-60; col 3, lines 36-43) printing a composition of semiconductor nanoparticles to form a patterned semiconductor film on a substrate by using any of variety including spin coating, casting, screen printing, stamping, wherein the printing of the composition with solvent includes screen printing, gravure printing, lithography. Shiho also

teaches (at paragraph 110) depositing the composition by inkjet printing, spray coating, spin coating, and irradiating the composition with an ultraviolet light (paragraph 138).

Shiho thus lacks selectively irradiating the composition through a mask (claims 51-54)

However, Tani teaches (at Figs 2,3; col 5, line 60 through col 6) selectively irradiating the layer through a mask aligned on substrate as marked, and removing a portion of the layer after irradiating in order to form a plurality of patterned layers.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to pattern the semiconductor film of the references including Shiho and Jacobson by selectively irradiating through a mask and removing a portion of the layer as taught by Tani. This is because these patterning techniques are alternative and art recognized equivalent for substitution in forming distinct patterned semiconductor films on the substrate so as a plurality of semiconductor thin film transistors can be fabricated at the same time.

4. Claims 135-138 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiho et al (2003/0045632), Kim et al (6,355,198) and Jacobson (6,294,401), as applied to claims 41-46,56-61,62-65,111-112,125,160-164 above, and further of Korgel (2003/0034486)

The references including Shiho, Kim and Jacobson teach a method for making a semiconductor film as applied to claims 41-46,56-61,62-65,111-112,125,160-164 above.

Shiho already teaches (at paragraphs 0061-0062) forming silicon particles having a diameter of from 0.005 micron (5 nm as 1 micron equals to 1000nm), while claims 135-138 recites silicon particles having an average diameter of less than 5 nm or 3.5 nm.

However, Korgel teaches (at col 15, lines 12-30) forming silicon particles comprising nano-particles having an average diameter of about 5 nm, 3.5 nm, or 2 nm.

The subject matter as a whole would have been obvious to one or ordinary skill in the art at the time the invention was made to select the portion of the prior art's range of average diameter of silicon particles, as taught by Korgel, which is within the range of applicant's claims, because of the desirability to form silicon nanoparticles for forming very small devices, and because it has been held to be obvious to select a value in a known range by optimization for the best results, and would be an unpatentable modification, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by

# EXHIBIT D

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Atty. Docket No. KOV-004

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

| | |
|---|---|
| IN RE APPLICATION OF: | : CONFIRMATION NO.: 2078 |
| Klaus KUNZE et al. | : GROUP ART UNIT: 2822 |
| APPLICATION NO: 10/616,147 | : |
| FILED: JULY 8, 2003 | : EXAMINER: TRINH, Michael M. |

FOR: RADIATION PATTERNABLE FUNCTIONAL MATERIALS, METHODS OF THEIR USE, AND STRUCTURES FORMED THEREFROM

I hereby certify that this document is being facsimile transmitted to the USPTO or deposited with the United States Postal Service as first class mail in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on June 11, 2007.

By: Jennie Heaton
Jennie Heaton

AMENDMENT AND REQUEST FOR RECONSIDERATION UNDER 35 U.S.C. 132 AND 37 C.F.R. 1.114

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SIR:

Responsive to the final Office Action dated March 12, 2007, Applicant respectfully requests reconsideration of the above-identified application in view of the following amendments and remarks.

Amendments to the Claims

Please cancel claim 42 and amend the remaining claims as follows:

1-40. (Canceled)

41. (Currently Amended) A method of making a patterned semiconductor film, comprising the steps of:

a) inkjet printing, gravure printing, printing by offset lithography, or flexographic printing a solution ~~composition~~ comprising passivated semiconductor nanoparticles, a first cyclic Group IVA compound of the formula (1):

$$(AH_x)_n, \qquad (1)$$

where n is from 3 to 8 and each A in the formula is independently Si or Ge, and/or a second cyclic Group IVA compound of the formula (2):

$$(AH_x)_m(AH_yR_{z-y})_p(ZR')_q, \qquad (2)$$

where (m + p + q) is from 3 to 12, each of the m instances of x is independently 0, 1 or 2, each of the p instances of y is independently 0, 1 or 2, each of the p instances of z is independently 0, 1 or 2, each of the p instances of (y + z) is independently 1 or 2, each of the q instances of w is independently 0 or 1, at least one of p and q is at least 1, each A in the formula (2) is independently Si or Ge, Z is selected from the group consisting of B, P and As, R' is R or H, and each R in the formula (2) is independently alkyl, ~~aryl, aralkyl, a halogen,~~ $BH_sR"_{2-s}$, $PH_sR"_{2-s}$, $AsH_sR"_{2-s}$ or $AH_tR"_{3-t}$, where s is 0 to 2, t is 0 to 3, and R" is alkyl~~, aryl, aralkyl, a halogen,~~ or $AH_3$, and a solvent in a pattern on a substrate; and

b) curing said printed ~~composition~~ pattern to form said patterned semiconductor film, wherein curing said printed ~~composition~~ pattern comprises irradiating said printed ~~composition~~ pattern, and said patterned semiconductor film comprises an

array of lines having a width of from 100 nm to 100 μm, a length of from 1 μm to 5000 μm, and a thickness of from 0.01 μm to 1000 μm.

42. (Cancelled)

43. (Currently Amended) The method of Claim 4241, ~~wherein~~ said semiconductor nanoparticles comprise further comprising soluble passivated semiconductor nanoparticles.

44. (Currently Amended) The method of Claim 4243, wherein said soluble passivated semiconductor nanoparticles comprise soluble passivated silicon nanoparticles.

45. (Currently Amended) The method of Claim 41, wherein said ~~composition~~ solution comprises both of said first and second cyclic Group IVA compounds.

46. (Currently Amended) The method of Claim 41, wherein said curing step comprises sintering said ~~composition~~ printed pattern to form said patterned semiconductor film.

47. (Canceled)

48. (Canceled)

49. (Canceled)

50. (Canceled)

51. (Currently Amended) The method of Claim 41, wherein said printing step further comprises selectively irradiating portions of said printed ~~composition~~solution, and

removing either irradiated or non-irradiated portions of said printed ~~composition~~ solution to form said pattern.

52. (Canceled)

53. (Original) The method of Claim 51, wherein said selectively irradiating substep comprises (i) positioning at least one of said substrate and a mask such that said portions can be selectively irradiated and said non-irradiated portions cannot be irradiated, and (ii) irradiating said layer with ultraviolet light through said mask.

54. (Original) The method of Claim 53, wherein said printing step further comprises the substep of aligning said mask to an alignment mark on said substrate.

55. (Canceled)

56. (Currently Amended) The method of Claim 41, wherein said printing step comprises inkjet printing said ~~composition~~ solution in said solvent in said pattern onto said substrate.

57. (Currently Amended) The method of Claim 41, wherein said printing step comprises gravure printing, offset lithography, or flexographic printing said ~~composition~~ solution in said solvent in said pattern onto said substrate.

58. (Currently Amended) The method of Claim 41, further comprising drying said ~~composition~~ solution and said substrate.

59. (Currently Amended) The method of Claim 43, wherein said curing step further comprises heating said ~~composition~~ pattern to a temperature of at least about 200 °C. to sinter said soluble passivated semiconductor nanoparticles and said ~~composition~~ pattern.

60. (Previously presented) The method of Claim 41, wherein said curing step further comprises placing said substrate into a chamber, and evacuating said chamber.

61. (Original) The method of Claim 60, wherein said curing step further comprises passing an inert and/or reducing gas into said chamber.

62. (Previously presented) The method of Claim 41, wherein said lines have a width of from 0.5 to 50 μm.

63. (Original) The method of Claim 62, wherein said lines have an inter-line spacing of from 100 nm to 100 μm.

64. (Previously presented) The method of Claim 62, wherein said lines have a length of from 2 μm to 2000 μm.

65. (Currently Amended) The method of Claim 62, wherein said lines have a thickness of from 0.01 μm to 500 μm.

66-95. (Canceled)

96. (Currently Amended) The method of Claim 43, wherein said soluble passivated semiconductor nanoparticles comprise silicon nanoparticles and a passivation layer thereon.

97. (Currently Amended) The method of Claim 96, ~~comprising~~ wherein said passivation layer comprises at least one member selected from the group consisting of an alcohol, an alcoholate, a thiol, ~~and~~ a thiolate, an $AR'_3$ group, an alkyl group, an aryl group, and an aralkyl group.

98. (Currently Amended) The method of Claim 96, wherein said passivation layer comprises hydrogen ~~and/or halogen~~ atoms.

99. (Previously presented) The method of Claim 96, wherein said passivation layer further comprises a surfactant.

100. (Currently Amended) The method of Claim 43, wherein said soluble passivated semiconductor nanoparticles have an average particle diameter of less than 5 nm.

101. (Currently Amended) The method of Claim 43, wherein said soluble passivated semiconductor nanoparticles have a particle size distribution of from 0.2 nm to less than 10 nm.

102. (Currently Amended) The method of Claim 41, wherein the solution comprises ~~comprising~~ the first cyclic Group IVA compound of the formula (1).

103. (Previously presented) The method of Claim 102, wherein each x in the formula (1) is 2.

104. (Previously presented) The method of Claim 102, wherein each A in the formula (1) is Si.

105. (Previously presented) The method of Claim 102, wherein n is 5.

106. (Previously presented) The method of Claim 103, wherein each A in the formula (1) is Si.

107. (Previously presented) The method of Claim 103, wherein n is 5.

108. (Previously presented) The method of Claim 106, wherein n is 5.

109. (Currently Amended) The method of Claim 41, wherein the ~~composition~~ solution consists essentially of said passivated semiconductor nanoparticles, said first cyclic Group IVA compound and said solvent.

110. (Currently Amended) The method of Claim 43, wherein the ~~composition~~ solution consists essentially of said soluble passivated semiconductor nanoparticles, said first and/or second cyclic Group IVA compounds, and said solvent.

111. (Currently Amended) The method of Claim 41, wherein the ~~composition~~ solution comprises said first and second cyclic Group IVA compounds, wherein p is 0 or 1, q is at least 1, (z - y) is 0, and Z is B or P.

112. (Currently Amended) The method of Claim 111, wherein R' in the formula (2) is alkyl~~, aryl, or aralkyl~~.

113. (Previously presented) The method of Claim 41, further comprising a compound of the formula $(ZH_uR_{3-u})_k$, where Z is selected from the group consisting of B, P and As, u is an integer of from 0 to 3, k is 1 or 2, and R is the same as for the second cyclic Group IVA compound.

114. (Previously presented) The method of Claim 113, wherein R in the formula $(ZH_uR_{3-u})_k$ is H or $AH_3$, where A is the same as for the second cyclic Group IVA compound.

115. (Previously presented) The method of Claim 113, wherein u is 0 or 3.

116. (Currently Amended) The method of Claim 41, wherein said first cyclic Group IVA compound is present in said ~~composition~~ solution in a percentage by weight of from 0.1% to 50%.

117. (Currently Amended) The method of Claim 43, wherein said soluble passivated semiconductor nanoparticles, and said at least one of said first cyclic Group IVA compound and said second cyclic Group IVA compound are present in said ink in a percentage by weight of from 0.1% to 50%.

118. (Previously presented) The method of Claim 41, wherein said solvent is aprotic.

119. (Previously presented) The method of Claim 41, wherein said solvent is apolar.

120. (Previously presented) The method of Claim 118, wherein said solvent is apolar.

121. (Previously presented) The method of Claim 118, wherein said solvent has a boiling point of less than 250 °C. at atmospheric pressure.

122. (Previously presented) The method of Claim 121, wherein said solvent has a boiling point of less than 150 °C. at atmospheric pressure.

123. (Currently Amended) The method of Claim 118, wherein said solvent is selected from the group consisting of alkanes, alkenes, ~~halogenated alkanes, halogenated alkenes, arenes, substituted arenes, ethers, cyclic ethers, aliphatic esters, aliphatic amides~~ and ~~aliphatic sulfoxides~~cycloalkanes.

124. (Currently Amended) The method of Claim 41, wherein said ~~composition~~ solution further comprises one or more additives selected from the group consisting of a tension reducing agent, a surfactant, a thickening agent, and a binder.

125. (Previously presented) The method of Claim 59, wherein said sintering temperature is at least about 300 °C.

126. (Currently Amended) The method of Claim 41, wherein said curing further comprises heating said cyclic Group IVA compound(s) to a temperature of at least about 100 °C. to dry the printed ~~composition~~solution, prior to irradiating said printed ~~composition~~pattern.

127. (Currently Amended) The method of Claim 126, wherein said curing step further comprises sintering said dried, irradiated ~~composition~~ pattern to form said patterned semiconductor film.

128. (Currently Amended) The method of Claim 41, comprising gravure printing said ~~composition~~ solution in said solvent in said pattern onto said substrate.

129. (Currently Amended) The method of Claim 41, comprising printing said ~~composition~~ solution in said solvent in said pattern onto said substrate by offset lithography.

130. (Currently Amended) The method of Claim 41, comprising flexographic printing said ~~composition~~ solution in said solvent in said pattern onto said substrate.

131. (Previously presented) The method of Claim 41, wherein curing is conducted under conditions sufficient to form a doped or undoped polysilane, polygermane or germanium-substituted polysilane having a molecular weight sufficiently high and/or a chemical composition sufficiently insoluble to resist subsequent treatment with processing solvents.

132. (Previously presented) The method of Claim 102, wherein at least one of the n instances of A is Ge.

133. (Currently Amended) The method of Claim 98, wherein said ~~composition~~ solution further comprises a surfactant.

134. (Previously presented) The method of Claim 133, wherein the surfactant comprises a tri-$C_1$-$C_{20}$ alkyl-substituted amine, a tri-$C_1$-$C_{20}$ alkyl-substituted amine oxide, a tetra-$C_1$-$C_{20}$ alkyl-substituted quaternary ammonium salt, a conventional betaine, a conventional sulfobetaine, a polyglycol of the formula H-(-$OCH_2CH_2$-)$_a$-OH (where $2 \leq a \leq 4$), a polyether of the formula $R^3$-(-$OCH_2CH_2$-)$_a$-$OR^4$ (where $R^3$ and $R^4$ are independently a $C_1$-$C_4$ alkyl group), a $C_4$-$C_{20}$ branched or unbranched, saturated or unsaturated aliphatic carboxylic acid ester of a $C_1$-$C_4$ alcohol, a $C_4$-$C_{20}$ aliphatic carboxylic acid thioester of a $C_1$-$C_4$ thiol, a tri-$C_1$-$C_{20}$ alkyl- or triaryl-substituted phosphine, a tri-$C_1$-$C_{20}$ alkyl- or triaryl-substituted phosphate, a di-$C_1$-$C_{20}$ alkyl- or diaryl-substituted phosphate salt, an aryl or $C_4$-$C_{20}$ branched or unbranched, saturated or unsaturated aliphatic sulfonic acid, an aryl or $C_4$-$C_{20}$ branched or unbranched, saturated or unsaturated aliphatic sulfonate, a di-$C_1$-$C_{20}$ alkyl sulfate, a $C_1$-$C_{20}$ alkyl sulfate salt, a ketone of the formula $R^5(C{=}O)R^6$ (where $R^5$ and $R^6$ are independently a $C_1$-$C_{20}$ alkyl or $C_6$-$C_{10}$ aryl group), and/or a conventional silicone.

135. (Previously presented) The method of Claim 44, wherein the silicon nanoparticles have an average diameter of less than 5 nm.

136. (Previously presented) The method of Claim 135, wherein the silicon nanoparticles have an average diameter of less than 3.5 nm.

137. (Previously Presented) The method of Claim 44, wherein the silicon nanoparticles have a size distribution range such that at least 95% of the nanoparticles have an average particle diameter of from 0.1 nm to 10 nm.

138. (Previously presented) The method of Claim 137, wherein the silicon nanoparticles have a size distribution range such that at least 98% of the nanoparticles have an average particle diameter from 0.5 nm to less than 5 nm.

139. (Currently Amended) The method of Claim 116, wherein the first cyclic Group IVA compound is present in the ~~composition~~ solution in a percentage by weight of from 0.5 to 30 wt.% .

140. (Currently Amended) The method of Claim 139, wherein the first cyclic Group IVA compound is present in the ~~composition~~ solution in a percentage by weight of from 1.0 to 20 wt.%.

141. (Currently Amended) The method of Claim 117, wherein the soluble passivated semiconductor nanoparticles and first and/or second cyclic Group IVA compound(s) are present in the ~~composition~~ solution in a percentage by weight of from 0.5 to 30 wt.%.

142. (Currently Amended) The method of Claim 117, wherein the soluble passivated semiconductor nanoparticles and the first and/or second cyclic Group IVA compounds are present in a weight ratio of from 0.1% to 90%.

143. (Currently Amended) The method of Claim 117, wherein the soluble passivated semiconductor nanoparticles and the first and/or second cyclic Group IVA compounds are present in a weight ratio of from 10% to 50%.

144. (Previously presented) The method of Claim 41, wherein the solvent has a gas-phase dipole moment of about 2 debyes or less.

145. (Previously presented) The method of Claim 144, wherein the solvent has a boiling point of about or less than 200 °C. at atmospheric pressure.

146. (Previously presented) The method of Claim 41, wherein the solvent has a gas-phase dipole moment of about 0.5 debye or less.

147. (Previously presented) The method of Claim 146, wherein the solvent has a boiling point of about or less than 150 °C. at atmospheric pressure.

148. (Currently Amended) The method of Claim 133, wherein the surfactant is present in the ~~composition~~ solution in an amount of from 0.05 wt.% to 0.5 wt.% of the composition.

149. (Currently Amended) The method of Claim 124, wherein the one or more additives are present in the ~~composition~~ solution in an amount of from 0.1 wt.% to 5 wt.%.

150. (Previously presented) The method of Claim 41, wherein the substrate comprises a semiconductor wafer or a transparent or translucent display window with a two-dimensional array of fields thereon.

151. (Currently Amended) The method of Claim 150, comprising inkjet printing, gravure printing, printing by offset lithography, or flexographic printing the ~~composition~~ solution in the pattern in each of the fields.

152. (Previously presented) The method of Claim 41, wherein the substrate comprises a glass or plastic window.

153. (Currently Amended) The method of Claim 41, further comprising irradiating portions of the printed ~~composition~~ solution with light having a wavelength and/or intensity sufficient to oligomerize or polymerize the irradiated portions of the ~~composition~~ solution.

154. (Currently Amended) The method of Claim 41, wherein the portions of the printed ~~composition with light~~ solution are irradiated with light sufficiently to convert irradiated cyclic Group IVA compounds to an insoluble polymer.

155. (Currently Amended) The method of Claim 41, further comprising removing solvent from the printed ~~composition~~ solution prior to curing.

156. (Previously presented) The method of Claim 59, wherein said sintering temperature is at least 400 °C.

157. (Previously presented) The method of Claim 41, further comprising cleaning the substrate with the patterned semiconductor film thereon.

158. (Previously presented) The method of Claim 157, wherein cleaning comprises rinsing the substrate with or immersing the substrate in a cleaning solvent, draining the cleaning solvent from the substrate, and drying the substrate and patterned semiconductor thin film.

159. (Previously presented) The method of Claim 157, wherein the cleaning solvent comprises a solvent in which the first cyclic Group IVA compound has a high solubility.

160. (Previously presented) The method of Claim 62, wherein said lines have a width of from 1 μm to 20 μm.

161. (Previously presented) The method of Claim 63, wherein said inter-line spacing is from 200 nm to 50 μm.

162. (Previously presented) The method of Claim 161, wherein said inter-line spacing is from 500 nm to 10 μm.

163. (Previously presented) The method of Claim 64, wherein said lines have a length of from 5 μm to 1000 μm.

164. (Previously presented) The method of Claim 65, wherein said lines have a thickness of from 0.05 μm to 250 μm.

## Remarks

Applicants and their undersigned representative thank Examiner Trinh for the detailed explanations in the final Office Action dated March 12, 2007. The claims have been amended to recite printing a *solution* (for example, the solution may further include *soluble* nanoparticles) in a pattern, and curing the printed pattern to form an array of patterned semiconductor film lines having stated width, length, and thickness dimensions. Although the cited references disclose printing silane inks in general terms, they do not disclose or suggest printing a solution in a pattern and curing the pattern to form such an array of lines, as defined in Claim 41.

The primary reference (Shiho et al., U.S. Pat. Appl. Publ. No. 2003/0045632 [hereinafter "Shiho"]) is concerned with making coatings for solar cells. As a result, it provides no motivation to one of ordinary skill in the art to print a solution in a pattern and cure the printed pattern to form an array of lines having the recited dimensions. The secondary references (Jacobson et al., U.S. Pat. No. 6,294,401 [hereinafter "Jacobson"], Kim, U.S. Pat. No. 6,355,198 [hereinafter "Kim"], and Tani, U.S. Pat. No. 5,254,439 [hereinafter "Tani"]) fail to cure this deficiency of the primary reference. Consequently, the present claims are considered patentable over the cited references.

## Restriction Response

The restriction requirement is respectfully traversed. Of the claims added in the previous amendment (Claims 96-164) the Examiner has withdrawn Claims 96-110, 113-124, 126-134 and 139-159 from consideration, as being directed to a non-elected invention. However, the withdrawn claims are merely dependent claims which add further limitations. For instance, claim 96 depends on active claim 43, and recites that said passivated semiconductor nanopariticles comprise "silicon nanoparticles and a passivation layer thereon."

MPEP 806.05(c)(II) states:

> "Where the relationship between the claims is such that the separately claimed subcombination B(sp) constitutes the essential distinguishing

> feature of the combination AB(sp) as claimed, the inventions are not distinct and a requirement for restriction must not be made..."

In this case, the restricted claims depend directly or indirectly from independent Claim 41. Thus, the restricted dependent claims represent a combination of independent Claim 41 (the claimed subcombination) with one or more further limitations (or further "features"). As a result, the claimed subcombination (independent Claim 41) defines the essential distinguishing feature of the present invention. Accordingly, restriction is not be proper, and should be withdrawn.

In effect, the new (constructive) Restriction Requirement in the final Office Action of March 12, 2007 adds an effective election of species requirement to the earlier Restriction Requirement, which election of species requirement was never made in the earlier Restriction Requirement. The withdrawn claims should be rejoined and examined with the active claims in this case.

The Rejection of Claims 41-46, 56-61, 62-65, 111-112, 125, 160-164 under 35 U.S.C. § 103(a)

The rejection of Claims 41-46, 56-61, 62-65, 111-112, 125 and 160-164 under 35 U.S.C. § 103(a) as being unpatentable over Shiho taken with Kim and further in view of Jacobson is respectfully traversed.

Shiho discloses a silane composition for preparing a semiconductor thin film of a solar cell. The silane composition contains a polysilane compound represented by the formula $Si_nR_m$ (n is an integer of 3 or more, m is an integer of n to (2n+2) and R is independently a hydrogen atom, alkyl group, phenyl group or halogen atom, with the proviso that when all of the R's are hydrogen atoms and m = 2n, n is an integer of 7 or more), and at least one silane compound selected from cyclopentasilane, cyclohexasilane and silylcyclopentasilane (Abstract). The silane composition of Shiho is believed to further contain insoluble silicon particles (component (C);

see paragraphs [0058]-[0064]: "silicon particles are dispersed ... whereby ... the film does not crack or peel off." [0064]).

Shiho teaches that a silicon film can be made by forming a coating film of the first or second silane composition on the substrate and then treating it with heat and/or light in a non-oxidizing atmosphere (see paragraphs [0105]-[0106]). Shiho also teaches that the coating film can be treated with light to convert it into a silicon film or silicon oxide film, and that a silicon film or silicon oxide film having a desired pattern can also be formed ***by exposing part of the coating film selectively using a photomask*** having a desired pattern (see paragraph [0127]). Shiho further teaches that the conductive film and insulating film may be formed and patterned before use, in which case they may be patterned by a general method such as masking or lithography, or by an ink jet method (see paragraph [0153]).

However, Shiho is silent with regard to the length and width dimensions of lines formed in such a pattern, since Shiho is concerned with making coatings for solar cells (see, e.g., paragraphs [0128]-[0152] of Shiho). This is especially significant with respect to the claims as presented, since the claimed printing step and the resulting pattern is greatly aided by the use of a solution. For example, it is believed that a dispersion of finely-divided silicon (e.g., the silicon particles of Shiho) cannot be reliably and/or reproducibly printed onto a substrate. (Note that claim 42 has been cancelled since unpassivated semiconductor nanoparticles, as such and as encompassed by the disclosure of Shiho, are generally not soluble.)

Therefore, Shiho does not disclose or suggest a method that forms a patterned semiconductor film comprising an array of lines having a width of from 100 nm to 100 μm and a length of from 1 μm to 5000 μm by curing/irradiating a silane-containing solution printed by inkjet printing, gravure printing, offset lithography, or flexographic printing, as recited in the present Claim 41. Consequently, Shiho is deficient with regard to the present claims.

Kim fails to cure the deficiencies of Shiho. For instance, Kim does not appear to cure a composition by irradiating the corresponding printed pattern. Instead, Kim appears to disclose curing by use of chemical reactions (e.g. col. 33, ll. 48 - 60). Consequently, Kim cannot suggest

the advantages for printing technology gained by irradiating a pattern formed from a printed ***solution***, as recited in the present claims.

Jacobson does not cure the deficiencies of Shiho and Kim, because Jacobson also fails to suggest how certain compositions can be cured by irradiating a solution printed in a pattern.

Jacobson discloses nanoparticles that are utilized to create, through deposition and patterning, functional electronic, electromechanical, and mechanical systems (Abstract, ll. 1-3). Monodisperse or polydisperse nanoparticles can form stable colloids or suspensions (not solutions, as claimed) in appropriate dispersing media. As a result, printing technology can be utilized to deposit and pattern nanoparticles for mass production or for personal desktop manufacturing (Abstract of Jacobson, last 7 lines).

Jacobson discloses that electromagnetic radiation, such as from a heat lamp or laser, may be used to *thermally* convert certain nanoparticles to their bulk state (col. 6, ll. 32-35), but Jacobson is silent with regard to irradiation of silane compounds, such as those of the formulas (1) and (2) in the present Claim 41. Also, like Shiho, Jacobson is silent with regard to the widths and lengths of lines in any printed and/or cured pattern. As a result, Jacobson does not cure the deficiencies of Shiho with regard to curing/irradiating a patterned semiconductor film comprising an array of lines having a width of from 100 nm to 100 μm and a length of from 1 μm to 5000 μm, formed by inkjet printing, gravure printing, offset lithography, or flexographic printing a (doped) silane-containing solution, as recited in the present Claim 41.

Consequently, no possible combination of Shiho, Jacobson and Kim can disclose or suggest irradiating or curing a patterned semiconductor film comprising an array of lines having a width of from 100 nm to 100 μm and a length of from 1 μm to 5000 μm, formed by inkjet printing, gravure printing, offset lithography, or flexographic printing a (doped) silane-containing solution, as recited in the present Claim 41. Therefore, this ground of rejection is unsustainable, and should be withdrawn.

The Rejection of Claims 51, 53-54 under 35 U.S.C. § 103(a)

The rejection of Claims 51-54 under 35 U.S.C. § 103(a) as being unpatentable over Shiho, Kim and Jacobson, further in view of Tani, is respectfully traversed.

As discussed above, the combination of Shiho, Jacobson and Kim is deficient with regard to irradiating or curing a patterned semiconductor film comprising an array of lines having a width of from 100 nm to 100 μm and a length of from 1 μm to 5000 μm, formed by inkjet printing, gravure printing, offset lithography, or flexographic printing a (doped) silane-containing solution, as recited in the present Claim 41. Tani fails to cure the deficiencies of Shiho, Jacobson, and Kim.

Tani discloses a polymer having linear --Si--O--Si-- bonds and --Si--Si--Si-- bonds, or polysilane bonds that are greater than trisilane bonds, sensitive to far ultraviolet rays (Abstract, ll. 1-4). The polymer undergoes oxidation with oxygen plasma to form $SiO_2$ that is resistant to oxygen dry etching, exhibits absorption peaks only in the far ultraviolet, and is suitable for preparing a single layered resist or an upper resist of a two-layered system (Abstract, last 5 lines). Tani also discloses a *rotary-coated* upper resist layer 3, selectively irradiated with pulses of KrF excimer laser rays 4 (248 nm) through a mask carrying a desired pattern (see col. 6, ll. 11-21, and FIG. 2(c) of Tani). Then, the exposed portions of the layer 3 were developed with ethanol to remove the same and to thus form a positive working upper resist pattern 3a (see col. 6, ll. 21-24, and FIG. 2(d) of Tani).

However, Tani appears to be silent with regard to printing. As a result, like Shiho, Jacobson and Bulthaup, Tani is necessarily silent with regard the widths and lengths of lines in any printed, cured, irradiated pattern, as well as the printing advantages gained by use of the solution recited in the present Claim 41. Also, Tani does not appear to disclose ***cyclic*** Group IVA compounds of the formulas (1) or (2), particularly in which the substituents bound to the Group IVA atoms are predominantly H (e.g., the present formula (2)) or exclusively H (e.g., the present formula (1)).

Consequently, no possible combination of Shiho, Jacobson, Kim and Tani can disclose or suggest irradiating or curing a patterned semiconductor film comprising an array of lines having a width of from 100 nm to 100 μm and a length of from 1 μm to 5000 μm, formed by inkjet printing, gravure printing, offset lithography, or flexographic printing a (doped) silane-containing solution, as recited in the present Claim 41. Therefore, this ground of rejection is unsustainable, and should be withdrawn.

The Rejection of Claims 135-138 under 35 U.S.C. § 103(a)

The rejection of Claims 135-138 under 35 U.S.C. § 103(a) as being unpatentable over Shiho, Kim and Jacobson, and further in view of Korgel is respectfully traversed.

Korgel is cited merely for disclosing nanoparticles having an average diameter of about 5 nm, 3.5 nm, or 2 nm. However, the reference does not cure the deficiencies of the combination of Shiho, Kim and Jacobson with respect to irradiating or curing a patterned semiconductor film comprising an array of lines having a width of from 100 nm to 100 μm and a length of from 1 μm to 5000 μm, formed by inkjet printing, gravure printing, offset lithography, or flexographic printing a (doped) silane-containing solution. Accordingly, this ground of rejection should be withdrawn on the same basis as claim 41.

Conclusions

In view of the above amendments and remarks, all bases for objection and rejection are overcome, and the application is in condition for allowance. Early notice to that effect is earnestly requested.

If it is deemed helpful or beneficial to the efficient prosecution of the present application, the Examiner is invited to contact Applicant's undersigned representative by telephone.

Respectfully submitted,

Andrew D. Fortney, Ph.D.
Reg. No. 34,600

401 W. Fallbrook Avenue, Suite 204
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# EXHIBIT E

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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/616,147 | 07/08/2003 | Klaus Kunze | KOV-004 | 2078 |

36872 7590 08/27/2007

THE LAW OFFICES OF ANDREW D. FORTNEY, PH.D., P.C.
401 W FALLBROOK AVE STE 204
FRESNO, CA 93711-5835

| EXAMINER | |
|---|---|
| TRINH, MICHAEL MANH | |
| **ART UNIT** | **PAPER NUMBER** |
| 2822 | |

| MAIL DATE | DELIVERY MODE |
|---|---|
| 08/27/2007 | PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/616,147 | KUNZE ET AL. | |
| | Examiner | Art Unit | |
| | Michael Trinh | 2822 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *11 June 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *41,43-46,51,53,54,56-65 and 96-164* is/are pending in the application.

4a) Of the above claim(s) *96-110,113-124,126-134 and 139-159* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *41,43-46,51,53,54,56-65,111,112,125,135-138 and 160-164* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

**DETAILED ACTION**

*** This office action is in response to Applicant's Amendment and RCE filed June 11, 2007. Claims 41,43-46,51,53-54,56-65, 96-164 are pending, in which claims 96-164 are non-elected.

*** The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

*** Note that using the relative term "high solubility" in withdrawn claim 159 renders the scope of the claim being unclear and indefinite, since it is high solubility with respect to which reference. Appropriate correction is required.

***Claim Rejections - 35 USC § 103***

1. Claims 41,43-46,56-61,62-65,111-112,125,160-164, are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiho et al (2003/0045632) taken with Jacobson et al (both 6,294,401 and 6,200,508) and Kim et al (6,355,198).

Shiho teaches (at paragraphs 38-93) a method for making a semiconductor film comprising at least the steps of: a) inkjet printing, offset printing , screen printing (paragraphs 110,153,54-64,162-167) a solution composition comprising passivated semiconductor nanoparticles, a first cyclic Group IVA compound of the formula SinRm , n is an integer of 3 or more and m is integer of 2n+2, wherein $Si_nH_{2n+2}$ is mentioned at paragraph 44, wherein dopants of B, P, and As with at least alkyl group are mentioned at paragraphs 76-82, which is corresponding to claimed formula (1):(AHx )n, where n is from 3 to 8 and each A in the formula is independently Si, and/or a second cyclic Group IVA compound of the formula (2):(AHx)m(AHyRzy)p(ZR')q, (2) where (m+p+q) is from 3 to 12, each of the m instances of x is independently 0, 1 or 2, each of the p instances of y is independently 0, 1 or 2, each of the p instances of z is independently 0, 1 or 2, each of the p instances of (y+z) is independently 1 or 2, each of the q instances of w is independently 0 or 1, at least one of p and q is at least 1, each A in the formula (2) is independently Si, Z is selected from the group consisting of B, P and As, R' is R or H, and each R in the formula (2) is independently alkyl, aryl, aralkyl, a halogen, BHsR"2s, PHsR"2-s, AsHR"2-s or AHtR".sub.3-t, where s is 0 to 2, t is 0 to 3, and R" is alkyl, aryl, aralkyl, a halogen, or AH3, and a solvent (paragraphs 0102-0103,153) in a film/pattern on a substrate, wherein it may be patterned by the application of the liquid material and patterning may be

carried out at the same time by an ink jet method; and b) curing said printed solution composition film/pattern to form said semiconductor film (paragraphs 117,120,137,138), wherein curing the printed pattern comprises irradiating the printed composition (paragraphs 138,113,137,120,153), wherein the semiconductor film comprising a film particularly preferably having a thickness of 0.01 to 5 microns (paragraphs 0110). Re claims 42-44, wherein the composition comprises semiconductor silicon nanoparticles (paragraphs 60-64) and passivated as the silicon particles are dispersed in the silane composition. Re claims 45,111-112, wherein the composition including both first and second cyclic group IVA compound of silicon and dopants of B, P, As (at paragraphs 38-93), herein $Si_nH_{2n+2}$ is mentioned at paragraph 44, wherein dopants of B, P, and As with at least alkyl group are mentioned at paragraphs 76-82. Re claims 46,58 wherein curing by heating so as to sintering the semiconductor film so as to dry the semiconductor film (paragraphs 117,120,137-138), wherein curing comprises irradiating the composition (paragraphs 120,138). Re claims 58-59, 125, wherein curing by heating so as to sintering the semiconductor film so as to dry the semiconductor film at a temperature at least about 200°C (paragraphs 117,120,137-138), wherein sintering temperature is at least about 300°C (paragraphs 117,120,137-138). Re claims 60-61, wherein the curing heat treatment is evacuated so as to treat in an inert argon gas or reducing hydrogen gas in chamber, inherently (paragraphs 117, 137).

Re claim 41, Shiho already teaches inkjet printing a semiconductor film having a thickness, particularly preferably of 0.01 to 5μm (paragraph 0110), while claim 41 recites an array of lines having a width of from 100nm to 100μm, a length of from 1 to 5000μm , and a thickness of from 0.01 to 1000 μm, and lacks forming the semiconductor film as a patterned semiconductor film from a solution, and by gravure printing.

However, Jacobson '401 teaches (at col 5, lines 34-60; col 3, lines 36-65; col 4, lines 32-64) printing passivated semiconductor nanoparticles to form a patterned semiconductor film on a substrate by using any of variety including spin coating, casting, screen printing, stamping, etc, wherein the patterned semiconductor film is used in forming a thin film transistor, wherein printing is performed by ink jetting the solution composition comprising a solvent and the passivated semiconductor nanoparticles onto the substrate to form a pattern (re further claim 56, col 5, lines 34-45, col 6, lines 1-10; col 4, lines 13-15; Fig 4, col 7, lines 10-20), wherein ink-jet

system is configured to deliver a selected of a series of solution, colloids, and/or dispersion of one or more materials, wherein the nanoparticles may be passivated at the surface by an organic capping group which is largely determined the solubility of the particles (col 4, lines 48-64), wherein by employing a screen printing process, the composition solution with the nanoparticles and the solvent is inherently deposited on the substrate through stencil on or over the substrate, and wherein the printing of the composition with solvent includes screen printing, gravure printing, lithography (re claim 57). Jacobson '508 also teaches (at Figures 1A-1C; col 2, line 31 through col 3) making a patterned semiconductor film by ink jet printing a pattern on a substrate, and curing the pattern to form the patterned semiconductor film by ink jet printing an ink having a composition solution comprising semiconductor particles having semiconductor properties such as silicon and a solvent, wherein the semiconductors may be dispersed or dissolved in an appropriate solvent. Kim teaches (at Figs 1,15,16; col 34, lines 13-50) printing and curing a composition to form an array of lines having a typical width of from 1μm to 10μm, a length of from 100μm , and a thickness as similar to a width and spacing of from 1μm to 10μm (re further claims 41,62-65,160-164).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the semiconductor film of Shiho as a patterned semiconductor film by inkjet printing, Gravure printing, offset printing, screen printing, and spin coating a solution composition comprising passivated semiconductor nanoparticles and a solvent onto a substrate to form a pattern, as taught by Jacobson (both '401 and '508) and Shiho above, wherein by employing the ink jet printing method for forming the pattern, the passivated semiconductor nanoparticles can be dissolved/soluble or dispersed in the solvent as further taught by Jacobson (both '401 and '508). This is because of the desirability to employ the ink-jet printing method or other printing processes for directly forming a plurality of patterned semiconductor films of a plurality of semiconductor thin film transistors, on desired and selected portions of the substrate without performing a photolithographic process for patterning, wherein by employing the ink-jetting method for depositing a pattern line, using a solution comprising passivated semiconductor nanoparticles dissolved/soluble in the solvent would effectively reduce and prevent clogging of the ink-jet nozzles (a commonly known problem in the ink-jet printing method). Moreover, it would have been obvious because a person of ordinary skill in the art

would have been motivated to combine the prior art to achieve the claimed invention and that there would have been a reasonable expectation of success when employing a composition solution in the ink jet printing method, and because "a person of ordinary skill has a good reason to pursue the known options within his or her technical grasp. If this lead to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense" for forming a plurality of semiconductor patterns on a substrate, and because ink jet printing method is a particular known technique was recognized as part of the ordinary capabilities. In re Supreme Court Decision in KSR International Co. v. Teleflex Inc. 82 USPQ2d, 1385 (2007). Furthermore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the semiconductor film of Shiho as an array of lines of a patterned semiconductor film having a typical width of from 1μm to 10μm, a length of from 100μm , and a thickness as similar to a width of from 1μm to 10μm by inkjet printing, gravure printing, offset printing, as taught by Kim and Shiho above. This is because of the desirability to form an array of lines of patterned semiconductor films having a desired dimensions on the substrate, and for used in manufacturing a plurality of semiconductor device.

The subject matter as a whole would have been obvious to one or ordinary skill in the art at the time the invention was made to select the portion of the prior art's range of thickness, as taught by Kim and Shiho, which is within the range of applicant's claims, because it has been held to be obvious to select a value in a known range by optimization for the best results, and would be an unpatentable modification, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation". *In Re Aller* 104 USPQ 233,255 (CCPA 1955); *In re Waite* 77 USPQ 586 (CCPA 1948); *In Re Swanson* 56 USPQ 372 (CCPA 1942); *In Re Sola* 25 USPQ 433 (CCPA 1935); and *In Re Dreyfus* 24 USPQ 52 (CCPA 1934).

2. Claims 51,53-54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiho et al (2003/0045632), Jacobson et al (both 6,294,401 and 6,200,508) and Kim et al (6,355,198), as applied to claims 41-46,56-61,62-65,111-112,125,160-164 above, and further of Tani et al (5,254,439).

The references including Shiho, Kim and Jacobson teach a method for making a semiconductor film as applied to claims 41-46,56-61,62-65,111-112,125,160-164 above. Jacobson '401 teaches (at col 5, lines 34-60; col 3, lines 36-43) printing a composition of semiconductor nanoparticles to form a patterned semiconductor film on a substrate by using any of variety including spin coating, casting, screen printing, stamping, wherein the printing of the composition with solvent includes screen printing, gravure printing, lithography. Jacobson '508 teaches (at Figures 1A-1C; col 2, line 31 through col 3) making a patterned semiconductor film by ink jet printing a pattern on a substrate, and curing the pattern to form the patterned semiconductor film by ink jet printing an ink through a patterned aperture mask 21. Kim teaches (at Figs 1,15,16; col 34, lines 13-50) printing and curing a composition to form an array of lines having a typical width of from 1μm to 10μm, a length of from 100μm , and a thickness as similar to a width and spacing of from 1μm to 10μm (re further claims 41,62-65,160-164). Shiho also teaches (at paragraph 110) depositing the composition by inkjet printing, spray coating, spin coating, and irradiating the composition with an ultraviolet light (paragraph 138).

Shiho thus lacks selectively irradiating the composition through a mask (claims 51-54)

However, Tani teaches (at Figs 2,3; col 5, line 60 through col 6) selectively irradiating the layer through a mask aligned on substrate as marked, and removing a portion of the layer after irradiating in order to form a plurality of patterned layers.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to pattern the semiconductor film of the references including Shiho and Jacobson (both) by selectively irradiating through a mask and removing a portion of the layer as taught by Tani. This is because these patterning techniques are alternative and art recognized equivalent for substitution in forming distinct patterned semiconductor films on the substrate so as a plurality of semiconductor thin film transistors can be fabricated at the same time.

3. Claims 135-138 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiho et al (2003/0045632), Jacobson et al (both 6,294,401 and 6,200,508) and Kim et al (6,355,198), as applied to claims 41-46,56-61,62-65,111-112,125,160-164 above, and further of Korgel (2003/0034486)

The references including Shiho, Kim and both Jacobson teach a method for making a semiconductor film as applied to claims 41-46,56-61,62-65,111-112,125,160-164 above.

Shiho already teaches (at paragraphs 0061-0062) forming silicon particles having a diameter of from 0.005 micron (5 nm as 1 micron equals to 1000nm), while claims 135-138 recites silicon particles having an average diameter of less than 5 nm or 3.5 nm.

However, Korgel teaches (at col 15, lines 12-30) forming silicon particles comprising nano-particles having an average diameter of about 5 nm, 3.5 nm, or 2 nm.

The subject matter as a whole would have been obvious to one or ordinary skill in the art at the time the invention was made to select the portion of the prior art's range of average diameter of silicon particles, as taught by Korgel, which is within the range of applicant's claims, because of the desirability to form silicon nanoparticles for forming very small devices, and because it has been held to be obvious to select a value in a known range by optimization for the best results, and would be an unpatentable modification, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation". *In Re Aller* 104 USPQ 233,255 (CCPA 1955); *In re Waite* 77 USPQ 586 (CCPA 1948); *In Re Swanson* 56 USPQ 372 (CCPA 1942); *In Re Sola* 25 USPQ 433 (CCPA 1935); and *In Re Dreyfus* 24 USPQ 52 (CCPA 1934).

***Response to Amendment***

4. Regarding restriction: Applicant remarked about newly added claims 96-104 in that claim 96 depends on active claim 43, and the restricted claims depend directly or indirectly form independent claim 41.

In response, independent claim 41 is a generic claim, and being currently considered and examined with elected species. Thus, upon the allowance of a generic claim, applicant will be entitled to consideration of claims to *additional species which are written in dependent form or otherwise include all the limitations of an allowed generic claim as provided by 37 CFR 1.141.* If claims are added after the election, applicant must indicate which are readable upon the elected species. MPEP § 809.02(a). Accordingly, Claims 96-110,113-124,126-134,139-159 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b).

5. Regarding prior arts:

Applicant's remarks filed June 11, 2007 with respect to pending claims have been considered but are moot in view of the new ground(s) of rejection.

Applicant apparently remarked that Shiho does not forming a pattern since Shiho teaches forming a desired pattern by exposing part of the coating film selectively using a photomask.

In response, this is noted and found unconvincing. First, Shiho clearly teaches (at paragraph 0153) that it "may be patterned by...the application of the liquid material and patterning may be carried out at the same time by an ink jet method". Thus, by employing an ink jet method, a pattern is formed on a substrate due to the liquid materials are ink-jetted from a nozzle. Second, Jacobson and Kim also further teach the desirability to directly form a pattern on a substrate without performing a photolithographic process for patterning.

Shiho also clearly teaches the application of liquid material by an ink jet method. Moreover, Jacobson et al (both '401 and '508) further teach using a solution of composition in an ink jet system. Clogging of the ink-jet nozzles is effectively reduced and avoided. Moreover, it would have been obvious because a person of ordinary skill in the art would have been motivated to combine the prior art to achieve the claimed invention and that there would have been a reasonable expectation of success when employing a composition solution in the ink jet printing method, and because "a person of ordinary skill has a good reason to pursue the known options within his or her technical grasp. If this lead to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense" for forming a plurality of semiconductor patterns on a substrate, and because ink jet printing method is a particular known technique was recognized as part of the ordinary capabilities. In re Supreme Court Decision in KSR International Co. v. Teleflex Inc. 82 USPQ2d, 1385 (2007).

**********

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael M. Trinh whose telephone number is (571) 272-1847. The examiner can normally be reached on M-F: 9:00 Am to 5:30 Pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra Smith can be reached on (571) 272-2429. The central fax phone number is (703) 872-9306.

# EXHIBIT F

COPY

Atty. Docket No. KOV-004

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

| | |
|---|---|
| IN RE APPLICATION OF: | : |
| Klaus KUNZE | : GROUP ART UNIT: 2822 |
| APPLICATION NO: 10/616,147 | : |
| FILED: July 8, 2003 | : EXAMINER: TRINH, MICHAEL MANH |

FOR: COMPOSITIONS AND METHODS FOR FORMING A SEMICONDUCTING AND/OR SILICON-CONTAINING FILM, AND STRUCTURES FORMED

I hereby certify that this document is being electronically or facsimile transmitted to the USPTO or deposited with the United States Postal Service as first class mail in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on January 22, 2008.

By: Ann L. Taylor
Ann L. Taylor

AMENDMENT AND REQUEST FOR RECONSIDERATION UNDER 35 U.S.C. 132 AND 37 C.F.R. 1.111

Mail Stop AMENDMENT
COMMISSIONER FOR PATENTS
P.O. BOX 1450
ALEXANDRIA, VA 22313-1450

SIR:

Responsive to the Office Action dated August 27, 2007, Applicant respectfully requests reconsideration of the above-identified application in view of the following amendments and remarks.

Amendments to the Claims

Please add new Claims 165-205, cancel Claims 45, 102, 120, and 151, and amend the remaining claims as follows:

41. (Currently Amended) A method of making a patterned semiconductor film, comprising the steps of:

a) ~~inkjet printing,~~ gravure printing, printing by offset lithography, or flexographic printing a solution comprising passivated semiconductor nanoparticles, a first cyclic Group IVA compound of the formula (1):

$$(AH_x)_n, \qquad (1)$$

where n is from 3 to 8, each of the n instances of x is independently 1 or 2, and each A in the formula is independently Si or Ge, ~~and/or a second cyclic Group IVA compound of the formula (2):~~

~~$$(AH_x)_m(AH_yR_{z-y})_p(ZR')_q, \qquad (2)$$~~

~~where (m + p + q) is from 3 to 12, each of the m instances of x is independently 0, 1 or 2, each of the p instances of y is independently 0, 1 or 2, each of the p instances of z is independently 0, 1 or 2, each of the p instances of (y + z) is independently 1 or 2, each of the q instances of w is independently 0 or 1, at least one of p and q is at least 1, each A in the formula (2) is independently Si or Ge, Z is selected from the group consisting of B, P and As, R' is R or H, and each R in the formula (2) is independently alkyl, $BH_sR"_{2-s}$, $PH_sR"_{2-s}$, $AsH_sR"_{2-s}$ or $AH_tR"_{3-t}$, where s is 0 to 2, t is 0 to 3, and R" is alkyl or $AH_3$,~~ and a solvent in a pattern on a substrate; and

curing said printed pattern to form said patterned semiconductor film, wherein curing said printed pattern comprises irradiating said printed pattern~~, and said patterned semiconductor film comprises an array of lines having a width of from~~

~~100 nm to 100 μm, a length of from 1 μm to 5000 μm, and a thickness of from 0.01 μm to 1000 μm~~.

42. (Canceled)

43. (Currently Amended) The method of Claim 41, wherein said semiconductor nanoparticles comprise ~~further comprising~~ soluble passivated semiconductor nanoparticles.

44. (Previously Presented) The method of Claim 43, wherein said soluble passivated semiconductor nanoparticles comprise soluble passivated silicon nanoparticles.

45. (Canceled)

46. (Previously Presented) The method of Claim 41, wherein said curing step comprises sintering said printed pattern to form said patterned semiconductor film.

47. (Canceled)

48. (Canceled)

49. (Canceled)

50. (Canceled)

51. (Currently Amended) The method of Claim 41, ~~wherein said printing step~~ further ~~comprises~~ comprising selectively irradiating portions of said printed solution, and

removing either irradiated or non-irradiated portions of said printed solution to form said pattern.

52. (Canceled)

53. (Original) The method of Claim 51, wherein said selectively irradiating substep comprises (i) positioning at least one of said substrate and a mask such that said portions can be selectively irradiated and said non-irradiated portions cannot be irradiated, and (ii) irradiating said layer with ultraviolet light through said mask.

54. (Original) The method of Claim 53, wherein said printing step further comprises the substep of aligning said mask to an alignment mark on said substrate.

55. (Canceled)

56. (Currently Amended) The method of Claim [[41]] 166, wherein said printing step comprises inkjet printing said solution in said solvent in said pattern onto said substrate.

57. (Currently Amended) The method of Claim [[41]] 166, wherein said printing step comprises gravure printing, offset lithography, or flexographic printing said solution in said solvent in said pattern onto said substrate.

58. (Previously Presented) The method of Claim 41, further comprising drying said solution and said substrate.

59. (Currently Amended) The method of Claim 43, wherein said curing step further comprises heating said pattern to a temperature of at least about 200 °C[[.]] to sinter said soluble passivated semiconductor nanoparticles ~~and~~ in said pattern.

60. (Previously Presented) The method of Claim 41, wherein said curing step further comprises placing said substrate into a chamber, and evacuating said chamber.

61. (Original) The method of Claim 60, wherein said curing step further comprises passing an inert and/or reducing gas into said chamber.

62. (Currently Amended) The method of Claim 41, wherein said pattern comprises lines ~~have~~ having a width of from 0.5 to 50 μm.

63. (Original) The method of Claim 62, wherein said lines have an inter-line spacing of from 100 nm to 100 μm.

64. (Previously Presented) The method of Claim 62, wherein said lines have a length of from 2 μm to 2000 μm.

65. (Previously Presented) The method of Claim 62, wherein said lines have a thickness of from 0.01 μm to 500 μm.

66-95. (Canceled)

96. (Previously Presented) The method of Claim 43, wherein said soluble passivated semiconductor nanoparticles comprise silicon nanoparticles and a passivation layer thereon.

97. (Previously Presented) The method of Claim 96, wherein said passivation layer comprises at least one member selected from the group consisting of an alcohol, an alcoholate, a thiol, a thiolate, an $AR'_3$ group, an alkyl group, an aryl group, and an aralkyl group.

98. (Previously Presented) The method of Claim 96, wherein said passivation layer comprises hydrogen atoms.

99. (Previously Presented) The method of Claim 96, wherein said passivation layer further comprises a surfactant.

100. (Previously Presented) The method of Claim 43, wherein said soluble passivated semiconductor nanoparticles have an average particle diameter of less than 5 nm.

101. (Previously Presented) The method of Claim 43, wherein said soluble passivated semiconductor nanoparticles have a particle size distribution of from 0.2 nm to less than 10 nm.

102. (Canceled)

103. (Currently Amended) The method of Claim [[102]] 41, wherein each x in the formula (1) is 2.

104. (Currently Amended) The method of Claim [[102]] 41, wherein each A in the formula (1) is Si.

105. (Currently Amended) The method of Claim [[102]] 41, wherein n is 5.

106. (Previously Presented) The method of Claim 103, wherein each A in the formula (1) is Si.

107. (Previously Presented) The method of Claim 103, wherein n is 5.

108. (Previously Presented) The method of Claim 106, wherein n is 5.

109. (Previously Presented) The method of Claim 41, wherein the solution consists essentially of said passivated semiconductor nanoparticles, said first cyclic Group IVA compound and said solvent.

110. (Currently Amended) The method of Claim 43, wherein the solution consists essentially of said soluble passivated semiconductor nanoparticles, said first ~~and/or second~~ cyclic Group IVA compound[[s]], and said solvent.

111. (Currently Amended) The method of Claim [[41]] 165, ~~wherein the solution comprises said first and second cyclic Group IVA compounds,~~ wherein p is 0 or 1, q is at least 1, (z - y) is 0, and Z is B or P.

112. (Previously Presented) The method of Claim 111, wherein R' in the formula (2) is alkyl.

113. (Currently Amended) The method of Claim 41, wherein said solution further comprises a compound of the formula $(ZH_uR_{3-u})_k$, where Z is selected from the group consisting of B, P and As, u is an integer of from 0 to 3, k is 1 or 2, and each R is ~~the same as for the second cyclic Group IVA compound~~independently alkyl, $BH_sR"_{2-s}$, $PH_sR"_{2-s}$, $AsH_sR"_{2-s}$ or $AH_tR"_{3-t}$, where s is 0 to 2, t is 0 to 3, and R" is alkyl or $AH_3$.

114. (Currently Amended) The method of Claim 113, wherein R in the formula $(ZH_uR_{3-u})_k$ is H or $AH_3$, where A is ~~the same as for the second cyclic Group IVA compound~~Si or Ge.

115. (Previously Presented) The method of Claim 113, wherein u is 0 or 3.

116. (Previously Presented) The method of Claim 41, wherein said first cyclic Group IVA compound is present in said solution in a percentage by weight of from 0.1% to 50%.

117. (Currently Amended) The method of Claim [[43]] 165, wherein said soluble passivated semiconductor nanoparticles, ~~and said at least one of~~ said first cyclic Group IVA compound and said second cyclic Group IVA compound are present in said ink in a percentage by weight of from 0.1% to 50%.

118. (Previously Presented) The method of Claim 41, wherein said solvent is aprotic.

119. (Previously Presented) The method of Claim 41, wherein said solvent is apolar.

120. (Canceled)

121. (Currently Amended) The method of Claim 118, wherein said solvent has a boiling point of less than 250 °C[[.]] at atmospheric pressure.

122. (Currently Amended) The method of Claim 121, wherein said solvent has a boiling point of less than 150 °C[[.]] at atmospheric pressure.

123. (Currently Amended) The method of Claim 118, wherein said solvent is selected from the group consisting of alkanes, ~~alkenes,~~ arenes, and cycloalkanes.

124. (Previously Presented) The method of Claim 41, wherein said solution further comprises one or more additives selected from the group consisting of a tension reducing agent, a surfactant, a thickening agent, and a binder.

125. (Previously Presented) The method of Claim 59, wherein said sintering temperature is at least about 300 °C.

126. (Currently Amended) The method of Claim [[41]]166, wherein said curing further comprises heating said cyclic Group IVA compound(s) to a temperature of at least about 100 °C[[.]] to dry the printed solution~~, prior to irradiating said printed pattern~~.

127. (Previously Presented) The method of Claim 126, wherein said curing step further comprises sintering said dried, irradiated pattern to form said patterned semiconductor film.

128. (Previously Presented) The method of Claim 41, comprising gravure printing said solution in said solvent in said pattern onto said substrate.

129. (Previously Presented) The method of Claim 41, comprising printing said solution in said solvent in said pattern onto said substrate by offset lithography.

130. (Previously Presented) The method of Claim 41, comprising flexographic printing said solution in said solvent in said pattern onto said substrate.

131. (Currently Amended) The method of Claim [[41]] 166, wherein curing is conducted under conditions sufficient to form a doped or undoped ~~polysilane,~~ polygermane or germanium-substituted polysilane that is sufficiently insoluble and/or that has ~~having~~ a molecular weight sufficiently high ~~and/or a chemical composition sufficiently insoluble~~ to resist subsequent treatment with processing solvents.

132. (Currently Amended) The method of Claim [[102]] 41, wherein at least one of the n instances of A is Ge.

133. (Currently Amended) The method of Claim 98, wherein said solution further comprises a surfactant.

134. (Previously Presented) The method of Claim 133, wherein the surfactant comprises a tri-$C_1$-$C_{20}$ alkyl-substituted amine, a tri-$C_1$-$C_{20}$ alkyl-substituted amine oxide, a tetra-$C_1$-$C_{20}$ alkyl-substituted quaternary ammonium salt, a conventional betaine, a conventional sulfobetaine, a polyglycol of the formula $H\text{-}(\text{-}OCH_2CH_2\text{-})_a\text{-}OH$ (where $2 \leq a \leq 4$), a polyether of the formula $R^3\text{-}(\text{-}OCH_2CH_2\text{-})_a\text{-}OR^4$ (where $R^3$ and $R^4$ are independently a $C_1$-$C_4$ alkyl group), a $C_4$-$C_{20}$ branched or unbranched, saturated or unsaturated aliphatic carboxylic acid ester of a $C_1$-$C_4$ alcohol, a $C_4$-$C_{20}$ aliphatic carboxylic acid thioester of a $C_1$-$C_4$ thiol, a tri-$C_1$-$C_{20}$ alkyl- or triaryl-substituted phosphine, a tri-$C_1$-$C_{20}$ alkyl- or triaryl-substituted phosphate, a di-$C_1$-$C_{20}$ alkyl- or diaryl-substituted phosphate salt, an aryl or $C_4$-$C_{20}$ branched or unbranched, saturated or unsaturated aliphatic sulfonic acid, an aryl or $C_4$-$C_{20}$ branched or unbranched, saturated or unsaturated aliphatic sulfonate, a di-$C_1$-$C_{20}$ alkyl sulfate, a $C_1$-$C_{20}$ alkyl sulfate salt, a ketone of the formula $R^5(C{=}O)R^6$ (where $R^5$ and $R^6$ are independently a $C_1$-$C_{20}$ alkyl or $C_6$-$C_{10}$ aryl group), and/or a conventional silicone.

135. (Previously Presented) The method of Claim 44, wherein the silicon nanoparticles have an average diameter of less than 5 nm.

136. (Previously Presented) The method of Claim 135, wherein the silicon nanoparticles have an average diameter of less than 3.5 nm.

137. (Previously Presented) The method of Claim 44, wherein the silicon nanoparticles have a size distribution range such that at least 95% of the nanoparticles have an average particle diameter of from 0.1 nm to 10 nm.

138. (Previously Presented) The method of Claim 137, wherein the silicon nanoparticles have a size distribution range such that at least 98% of the nanoparticles have an average particle diameter from 0.5 nm to less than 5 nm.

139. (Previously Presented) The method of Claim 116, wherein the first cyclic Group IVA compound is present in the solution in a percentage by weight of from 0.5 to 30 wt.% .

140. (Previously Presented) The method of Claim 139, wherein the first cyclic Group IVA compound is present in the solution in a percentage by weight of from 1.0 to 20 wt.%.

141. (Previously Presented) The method of Claim 117, wherein the soluble passivated semiconductor nanoparticles and first and/or second cyclic Group IVA compound(s) are present in the solution in a percentage by weight of from 0.5 to 30 wt.%.

142. (Previously Presented) The method of Claim 117, wherein the soluble passivated semiconductor nanoparticles and the first and/or second cyclic Group IVA compounds are present in a weight ratio of from 0.1% to 90%.

143. (Previously Presented) The method of Claim 117, wherein the soluble passivated semiconductor nanoparticles and the first and/or second cyclic Group IVA compounds are present in a weight ratio of from 10% to 50%.

144. (Previously Amended) The method of Claim 41, wherein the solvent has a gas-phase dipole moment of about 2 debyes or less.

145. (Currently Amended) The method of Claim 144, wherein the solvent has a boiling point of about or less than 200 °C[[.]] at atmospheric pressure.

146. (Previously Presented) The method of Claim 41, wherein the solvent has a gas-phase dipole moment of about 0.5 debye or less.

147. (Currently Amended) The method of Claim 146, wherein the solvent has a boiling point of about or less than 150 °C[[.]] at atmospheric pressure.

148. (Previously Presented) The method of Claim 133, wherein the surfactant is present in the solution in an amount of from 0.05 wt.% to 0.5 wt.% of the composition.

149. (Previously Presented) The method of Claim 124, wherein the one or more additives are present in the solution in an amount of from 0.1 wt.% to 5 wt.%.

150. (Previously Presented) The method of Claim 41, wherein the substrate comprises a semiconductor wafer or a transparent or translucent display window with a two-dimensional array of fields thereon.

151. (Canceled)

152. (Previously Presented) The method of Claim 41, wherein the substrate comprises a glass or plastic window.

153. (Currently Amended) The method of Claim [[41]] 166, further comprising irradiating portions of the printed solution with light having a wavelength and/or intensity sufficient to oligomerize or polymerize the irradiated portions of the solution.

154. (Currently Amended) The method of Claim [[41]] 166, wherein the portions of the printed solution are irradiated with light sufficiently to convert irradiated cyclic Group IVA compounds to an insoluble polymer.

155. (Previously Presented) The method of Claim 41, further comprising removing solvent from the printed solution prior to curing.

156. (Previously Presented) The method of Claim 59, wherein said sintering temperature is at least 400 °C.

157. (Previously Presented) The method of Claim 41, further comprising cleaning the substrate with the patterned semiconductor film thereon.

158. (Previously Presented) The method of Claim 157, wherein cleaning comprises rinsing the substrate with or immersing the substrate in a cleaning solvent, draining the cleaning solvent from the substrate, and drying the substrate and patterned semiconductor thin film.

159. (Previously Presented) The method of Claim 157, wherein the cleaning solvent comprises a solvent in which the first cyclic Group IVA compound has a high solubility.

160. (Previously Presented) The method of Claim 62, wherein said lines have a width of from 1 μm to 20 μm.

161. (Previously Presented) The method of Claim 63, wherein said inter-line spacing is from 200 nm to 50 μm.

162. (Previously Presented) The method of Claim 161, wherein said inter-line spacing is from 500 nm to 10 μm.

163. (Previously Presented) The method of Claim 64, wherein said lines have a length of from 5 μm to 1000 μm.

164. (Previously Presented) The method of Claim 65, wherein said lines have a thickness of from 0.05 μm to 250 μm.

165. (New) The method of Claim 43, wherein said solution further comprises a second cyclic Group IVA compound of the formula (2):

$$(AH_x)_m(AH_yR_{z-y})_p(ZR')_q,$$

where (m + p + q) is from 3 to 12, each of the m instances of x is independently 0, 1 or 2, each of the p instances of y is independently 0, 1 or 2, each of the p instances of z is independently 0, 1 or 2, each of the p instances of (y + z) is independently 1 or 2, each of the q instances of w is independently 0 or 1, at least one of p and q is at least 1, each A in the formula (2) is independently Si or Ge, Z is selected from the group consisting of B, P and As, R' is R or H, and each R in the formula (2) is independently alkyl, $BH_sR"_{2-s}$, $PH_sR"_{2-s}$, $AsH_sR"_{2-s}$ or $AH_tR"_{3-t}$, where s is 0 to 2, t is 0 to 3, and R" is alkyl or $AH_3$.

166. (New) A method of making a patterned semiconductor film, comprising the steps of:

a) inkjet printing, gravure printing, printing by offset lithography, or flexographic printing a solution comprising passivated semiconductor nanoparticles, at least one cyclogermane of the formula $(GeH_x)_n$ or cyclosilagermane of the formula $(AH_x)_n$, where n is from 3 to 8, each of the n instances of x is independently 1 or 2, and at least one first instance of A is silicon and at least one second instance of A is germanium, and a solvent in a pattern on a substrate; and

b) curing said printed pattern to form said patterned semiconductor film, wherein curing said printed pattern comprises irradiating said printed pattern.

167. (New) The method of Claim 166, wherein said solution further comprises a cyclosilane of the formula $(SiH_x)_n$, wherein n and x are defined in Claim 166.

168. (New) The method of Claim 166, comprising selectively irradiating portions of said printed solution, and removing either irradiated or non-irradiated portions of said printed solution to form said pattern.

169. (New) The method of Claim 166, further comprising drying said solution.

170. (New) The method of Claim 166, wherein said curing step comprises heating said pattern to a temperature of at least about 200 °C to sinter said passivated semiconductor nanoparticles in said pattern.

171. (New) The method of Claim 170, wherein said temperature is at least about 300 °C.

172. (New) The method of Claim 170, wherein said temperature is at least 400 °C.

173. (New) The method of Claim 166, wherein said passivated semiconductor nanoparticles comprise silicon nanoparticles and a passivation layer thereon.

174. (New) The method of Claim 166, wherein said passivated semiconductor nanoparticles comprise soluble passivated silicon nanoparticles.

175. (New) The method of Claim 173, wherein said passivation layer comprises at least one member selected from the group consisting of an alcohol, an alcoholate, a thiol, a thiolate, an $AR'_3$ group, an alkyl group, an aryl group, and an aralkyl group.

176. (New) The method of Claim 166, wherein said passivated semiconductor nanoparticles have an average particle diameter of less than 5 nm.

177. (New) The method of Claim 166, wherein said passivated semiconductor nanoparticles have a particle size distribution of from 0.2 nm to less than 10 nm.

178. (New) The method of Claim 166, wherein each x is 2.

179. (New) The method of Claim 166, wherein n is 5.

180. (New) The method of Claim 166, wherein said solution further comprises a compound of the formula $(ZH_uR_{3-u})_k$, where Z is selected from the group consisting of B, P and As, u is an integer of from 0 to 3, k is 1 or 2, and R is independently alkyl, $BH_sR"_{2-s}$, $PH_sR"_{2-s}$, $AsH_sR"_{2-s}$ or $AH_tR"_{3-t}$, where s is 0 to 2, t is 0 to 3, and R" is alkyl or $AH_3$.

181. (New) The method of Claim 180, wherein R in the formula $(ZH_uR_{3-u})_k$ is H or $AH_3$, where A is silicon and one of the instances of A is germanium.

182. (New) The method of Claim 180, wherein u is 0 or 3.

183. (New) The method of Claim 166, wherein said cyclogermane or cyclosilagermane is present in said solution in a percentage by weight of from 0.1% to 50%.

184. (New) The method of Claim 166, wherein the solution consists essentially of said passivated semiconductor nanoparticles, said cyclogermane or cyclosilagermane and said solvent.

185. (New) The method of Claim 166, wherein said solvent is aprotic.

186. (New) The method of Claim 166, wherein said solvent is apolar.

187. (New) The method of Claim 185, wherein said solvent has a boiling point of less than 250 °C at atmospheric pressure.

188. (New) The method of Claim 185, wherein said solvent has a boiling point of less than 150 °C at atmospheric pressure.

189. (New) The method of Claim 185, wherein said solvent is selected from the group consisting of alkanes, arenes, and cycloalkanes.

190. (New) The method of Claim 185, wherein the solvent has a gas-phase dipole moment of about 2 debyes or less.

191. (New) The method of Claim 185, wherein the solvent has a gas-phase dipole moment of about 0.5 debye or less.

192. (New) The method of Claim 174, wherein the silicon nanoparticles have a size distribution range such that at least 95% of the nanoparticles have an average particle diameter of from 0.1 nm to 10 nm.

193. (New) The method of Claim 192, wherein the silicon nanoparticles have a size distribution range such that at least 98% of the nanoparticles have an average particle diameter from 0.5 nm to less than 5 nm.

194. (New) The method of Claim 183, wherein said cyclogermane or cyclosilagermane is present in the solution in a percentage by weight of from 0.5 to 30 wt.% .

195. (New) The method of Claim 194, wherein the first cyclic Group IVA compound is present in the solution in a percentage by weight of from 1.0 to 20 wt.%.

196. (New) The method of Claim 166, wherein the substrate comprises a semiconductor wafer or a transparent or translucent display window with a two-dimensional array of fields thereon.

197. (New) The method of Claim 166, wherein the substrate comprises a glass or plastic window.

198. (New) The method of Claim 166, further comprising removing the solvent from the printed solution prior to curing.

199. (New) The method of Claim 166, further comprising cleaning the substrate with the patterned semiconductor film thereon.

200. (New) The method of Claim 199, wherein cleaning comprises rinsing the substrate with or immersing the substrate in a cleaning solvent, draining the cleaning solvent from the substrate, and drying the substrate and patterned semiconductor thin film.

201. (New) The method of Claim 199, wherein the cleaning solvent comprises a solvent in which the cyclogermane or cyclosilagermane has a high solubility.

202. (New) The method of Claim 41, wherein said passivated semiconductor nanoparticles comprise semiconductor nanoparticles and a passivation layer thereon, said passivation layer comprises alkyl or aralkyl groups.

203. (New) The method of Claim 166, wherein said passivated semiconductor nanoparticles comprise semiconductor nanoparticles and a passivation layer thereon, said passivation layer comprises alkyl or aralkyl groups.

204. (New) The method of Claim 41, further comprising irradiating said pattern after said printing and prior to said curing said printed patterned.

205. (New) The method of Claim 166, further comprising irradiating said pattern after said printing and prior to said curing said printed patterned.

## Remarks

Applicants and their representatives wish to thank Examiner Trinh for the thorough examination of the present application and the detailed explanations in the Office Action dated August 27, 2007. Claims 165-205 have been added, Claims 45, 102, 120, and 151 have been canceled, and Claims 41, 43, 51, 56, 57, 59, 62, 103-105, 110-111, 113-114, 117, 121-123, 126, 131-133, 145, 147, and 153-154 have been amended. Therefore, Claims 41, 43-44, 46, 51, 53-54, 56-65, 96-101, 103-119, 121-150, and 152-203 are active in the present application.

### The Rejection of Claims 41, 43-46, 56-65, 111-112, 125 and 160-164 under 35 U.S.C. § 103(a)

The rejection of Claims 41, 43-46, 56-65, 111-112, 125, and 160-164 under 35 U.S.C. § 103(a) as being unpatentable over Shiho et al., U.S. Patent Application Serial No. 2003/0045632 (hereinafter "Shiho") taken with Jacobson et al., U.S. Patent Nos. 6,294,401 (hereinafter "Jacobson '401") and 6,200,508 (hereinafter "Jacobson '508") and Kim et al., U.S. Patent No. 6,355,198 (hereinafter "Kim") is respectfully traversed.

Shiho discloses a method for making a silane composition for preparing a semiconductor thin film of a solar cell, in which the silane composition contains a polysilane compound and at least one silane compound selected from cyclopentasilane, cyclohexasilane, and silylcyclopentasilane (Abstract). In addition, Shiho discloses forming a silicon film on a substrate by forming the coating film of a silane composition on the substrate by means such as spray coating, roll coating, curtain coating, spin coating, screen printing, offset printing or ink jet printing (page 7, paragraphs [0106] and [0110]).

However, Shiho is silent with regard to making a patterned semiconducting film by gravure printing or flexographic printing a solution containing semiconductor nanoparticles and cyclic Group IVA compound. In addition, Shiho does not affirmatively disclose printing by offset lithography, as recited in Claim 41. Although Shiho discloses forming a silane composition on a substrate using an offset printing technique, it is understood by Applicant's undersigned representative that offset printing does not require lithography. Therefore, Shiho

disclosure does not disclose, inherently or explicitly, printing by offset lithography. Thus, Shiho is saliently deficient with regard to Claim 41.

Furthermore, Shiho is silent with regard to printing a solution comprising passivated semiconductor nanoparticles and ***at least one cyclogermane or cyclosilagermane***. The USPTO considers compounds containing silicon and compounds containing germanium to be patentably distinct.[1,2] As a result, Shiho does not disclose or suggest making a patterned semiconducting film by printing a solution comprising passivated semiconducting nanoparticles and ***at least one cyclogermane or cyclosilagermane***, as recited in new independent Claim 166. Thus, Shiho is deficient with regard to new Claim 166. The remaining cited references fail to cure the deficiencies of Shiho with regard to Claims 41 and 166.

Jacobson '401 discloses a method for making electronic, chemical, and mechanical devices by deposition and patterning nanoparticles through printing technology (Abstract). In addition, Jacobson '401 discloses a method for depositing and patterning nanoparticles suspended in liquid onto a substrate using a wide variety of processes, including ink jetting, spincoating, casting, lithography, gravure printing, screen printing, impact printing, stamping, contact printing (whereby a liquid or solid pattern is transferred from a plate, stamp or cylinder), or transfer onto the substrate through a mask (col. 5, ll. 34-40).

However, Jacobson '401 is silent with regard to making a patterned semiconductor film by flexographic printing a solution containing semiconductor nanoparticles and cyclic Group IVA compound, as recited in Claim 41. Furthermore, Jacobson '401 does not affirmatively disclose printing by offset lithography, as recited in Claim 41. Although Jacobson '401 disclose depositing and patterning nanoparticles suspended in liquid onto a substrate using a variety of processes, including lithography, lithography is a relatively broad term and does not necessarily suggest printing by offset lithography to one of ordinary skill in the art. For example, optical

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[1] See page 2, paragraph 2, of the Office Action dated December 18, 2007 in Application No. 10/789,317 (Attorney Docket No. IDR0020), requiring an election between species of Group IVA elements (submitted herewith).
[2] See page 2, paragraph 2, of the Office Action dated January 3, 2008 in Application No. 10/789,274 (Attorney Docket No. IDR0080), constructively electing claims reciting a silane and withdrawing claims reciting compounds comprising Si and Ge (submitted herewith; emphasis in original).

lithography is a common technique for making patterns on integrated circuits, but it does not appear to be immediately applicable to offset printing, as disclosed by Jacobson '401 (see Wolf et. al., *Silicon Processing For The VLSI ERA*, Vol. 1, Second Edition, 2000, Lattice Press, pp. xviii-xxi, 488, and 545, submitted herewith). Therefore, Jacobson '401 does not disclose, inherently or explicitly, printing by offset lithography.

Finally, although Jacobson '401 discloses (among a variety of printing methods), including gravure printing of nanoparticles suspended in liquid, Jacobson '401 fails to disclose printing an ink that comprises a cyclic Group IVA compound. One of ordinary skill in the art would not necessarily expect that gravure printing an ink containing a cyclic Group IVA compound and semiconducting particles would be successful based on Jacobson's deposition and patterning of nanoparticle inks because certain properties of cyclic Group IVA compounds, such as volatility, viscosity, and surface tension, might have been expected to render the ink unsuitable for gravure printing applications. As a result, Jacobson '401 does not necessarily suggest gravure printing a solution comprising passivated semiconductor nanoparticles and a cyclic Group IVA compound, as recited in Claim 41.

With regards to new Claim 166, Jacobson '401 fails to disclose printing a solution comprising passivated semiconductor nanoparticles and ***at least one cyclogermane or cyclosilagermane***, as recited in Claim 166. As discussed above, the USPTO considers compounds containing silicon and compounds containing germanium to be patentably distinct. Thus, Jacobson '401 fails to cure the deficiencies of Shiho with regard to Claims 41 and 166.

Jacobson '508 discloses a method of utilizing printing techniques to build three dimensional structures by depositing successive layers of a device onto a substrate (Abstract). Additionally, Jacobson '508 discloses a method employing a conventional ink jet technique to accomplish depositing the successive layers onto a substrate to build three dimensional structures, such as miniature switches, motors, and the like (col. 1 ll. 16 and 33-45). Furthermore, Jacobson '508 discloses a method of depositing an ink comprising particles that may consist of such materials as silicon, germanium, GaAs, or other suitable semiconductive materials in a vehicle, in which the vehicle may be a vinyl or other resin that is heat curable or

UV curable or any other suitable binder known in the art of electrically conducting inks (col. 2, ll. 31-35 and 44-46, and FIG. 1A).

However, Jacobson '508 is silent with regard to making a patterned semiconductor film by flexographic printing, printing by offset lithography, or gravure printing a solution containing semiconductor nanoparticles and a cyclic Group IVA compound, as recited in Claim 41.

In addition, Jacobson '508 fails to disclose printing a solution comprising passivated semiconductor nanoparticles and at least one cyclogermane or cyclosilagermane, as recited in Claim 166. Thus, Jacobson '508 fails to cure the deficiencies of Shiho and Jacobson '401 with regard to Claims 41 and 166.

Kim discloses a method for patterning chemically or biochemically active agents or other species on a substrate surface by providing a micro-mold having a contoured surface and forming, on a substrate surface, a chemically or biochemically active agent or fluid precursor of a structure (Abstract). Additionally, Kim discloses a method for forming waveguides having a width about 2-4 microns, a waveguide height about 1 micron, and a wide variety of lengths from 100 microns to centimeters (col. 34, ll. 16-26 and FIG. 1).

However, Kim does not disclose a method for making a patterned semiconducting film by gravure printing, printing by offset lithography, or flexographic printing a solution containing semiconductor nanoparticles and a cyclic Group IVA compound, as recited in Claim 41. Furthermore, Kim is silent with regard to printing a solution comprising passivated semiconductor nanoparticles and ***at least one cyclogermane or cyclosilagermane***, as recited in Claim 166. Thus, Kim fails to cure all the deficiencies of Shiho, Jacobson '401, and Jacobson '508 with regard to Claims 41 and 166.

Therefore, Claims 43-46, 56-65, 111-112, 125, and 160-164 depend on Claim 41, therefore include all of its limitations. Consequently, this ground of rejection is unsustainable, and should be withdrawn.

The Rejection of Claims 51 and 53-54 under 35 U.S.C. § 103(a)

The rejection of Claims 51 and 53-54 under 35 U.S.C. § 103(a) as being unpatentable over Shiho, Jacobson '401 and '508, and Kim, as applied to Claims 41-46, 56-65, 111-112, 125, and 160-164 above, and further of Tani et al., U.S. Patent No. 5,254,439 (hereinafter "Tani"), is respectfully traversed.

As discussed above, Shiho, Jacobson '401 and '508, and Kim are deficient with regard to making a patterned semiconductor film by gravure printing, printing by offset lithography, or flexographic printing a solution containing semiconductor nanoparticles and a cyclic Group IVA compound, as recited in Claim 41. Furthermore, Shiho, Jacobson '401 and '508, and Kim are deficient with regard to making a patterned semiconductor by printing a solution comprising passivated nanoparticles and ***at least one cyclogermane or cyclosilagermane***, as recited in Claim 166. Tani fails to cure the deficiencies of Shiho, Jacobson '401 and '508 with regard to Claims 41 and 166.

Tani discloses a method for preparing a polymer having linear –Si-O-Si- bonds and –Si-Si-Si- bonds, or polysilane bonds that are greater than trisilane bonds under oxidation with oxygen plasma to form $SiO_2$ resistant to oxygen dry etching, that is sensitive to far ultraviolet rays and suitable as a single layered resist or an upper resist of a two-layered system (Abstract). Furthermore, Tani discloses a method for forming a resist pattern using the previously mentioned polymer by selectively irradiated an upper resist layer (3) with pulses of KrF excimer laser rays (4) through a mask carrying a desired pattern (col. 6, ll. 16-20 and FIG. 2(c)).

However, Tani fails to disclose making a patterned semiconductor film by gravure printing, printing by offset lithography, or flexographic printing a solution, as recited in Claim 41. Furthermore, Tani does not suggest or disclose a printing a solution comprising passivated nanoparticle and ***at least one cyclogermane or cyclosilagermane***, as recited in Claim 166.

As a result, Tani fails to cure all the deficiencies of Shiho, Jacobson '401 and '508, and Kim with regard to Claims 41 and 166. Claims 51, 53-54 are dependent on Claim 41 and

therefore include all of its limitations. Consequently, this ground of rejection is unsustainable, and should be withdrawn.

The Rejection of Claims 135-138 under 35 U.S.C. § 103(a)

The rejection of Claims 135-138 under 35 U.S.C. § 103(a) as being unpatentable over Shiho, Jacobson '401 and '508, and Kim, as applied to Claims 41-46, 56-65, 111-112, 125, and 160-164 above, and further view of Korgel, U.S. Patent Application Serial No. 2003/0034486 (hereinafter "Korgel"), is respectfully traversed.

As discussed above, Shiho, Jacobson '401 and '508, and Kim are deficient with regard to a method of making a patterned semiconductor film by gravure printing, printing by offset lithography, or flexographic printing a solution containing semiconductor nanoparticles and a cyclic Group IVA compound, as recited in Claim 41. Furthermore, Shiho, Jacobson '401 and '508, and Kim do not suggest or disclose making a patterned semiconductor film by printing a solution comprising passivated nanoparticle and ***at least one cyclogermane or cyclosilagermane***, as recited in Claim 166. Korgel fails to cure the deficiencies of Shiho, Jacobson '401 and '508, and Kim with regards to Claims 41 and 166.

Korgel discloses a method for production of a robust, chemically stable, crystalline, passivated nanoparticle and composition containing the same, that emits light with high efficiencies and size-tunable and excitation energy tunable color (Abstract). In addition, Korgel discloses a method of forming nanocrystalline or amorphous particles, having an average diameter of between about 1 to about 100 Å from Group IV metals, by the thermal degradation of a precursor molecule in the presence of molecules that bind to the particle surface, referred to as a capping agent at high temperature and elevated pressure (page 1, paragraph [0010] and page 3, paragraph [0032]).

However, Korgel is silent with regard to making a patterned semiconductor film by gravure printing, printing by offset lithography, or flexographic printing a solution containing semiconductor nanoparticles and a cyclic Group IVA compound, as recited in Claim 41. In

addition, Korgel fails to disclose printing a solution comprising passivated semiconductor nanoparticles and ***at least one cyclogermane or cyclosilagermane***, as recited in Claim 166. Thus, Korgel fails to cure all of the deficiencies of Shiho, Jacobson '401 and '508, and Kim with regard to Claims 41 and 166. Claims 135-138 are dependent on Claim 41 and therefore includes all of its limitations. Consequently, this ground of rejection is unsustainable, and should be withdrawn.

## Conclusions

In view of the above amendments and remarks, all bases for objection and rejection are believed to be overcome, and the application is believed to be in condition for allowance. Early notice to that effect is earnestly requested.

If it is deemed helpful or beneficial to the efficient prosecution of the present application, the Examiner is invited to contact Applicant's undersigned representative by telephone.

Respectfully submitted,

Andrew D. Fortney, Ph.D.
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ADF:tjm

# EXHIBIT G

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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/616,147 | 07/08/2003 | Klaus Kunze | KOV-004 | 2078 |

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THE LAW OFFICES OF ANDREW D. FORTNEY, PH.D., P.C.
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| EXAMINER | |
|---|---|
| TRINH, MICHAEL MANH | |
| **ART UNIT** | **PAPER NUMBER** |
| 2822 | |

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|---|---|
| 05/30/2008 | PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/616,147 | KUNZE ET AL. | |
| | Examiner | Art Unit | |
| | Michael Trinh | 2822 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE ____ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☐ Responsive to communication(s) filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *41,43,44,46,51,53,54,56-65,96-101,103-119,121-150 and 152-205* is/are pending in the application.

4a) Of the above claim(s) *96-110,113-124,126-134,139-159 and 173-203* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *41,43,44,46,51,53,54,56-65,111-112,125,135-138,160-164* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

**DETAILED ACTION**

*** This office action is in response to Applicant's Amendment filed January 23, 2008. Claims 41,43-44,46,51,53-54,56-65, 96-101,103-119,121-150,152-205 are pending, in which claims 96-110,113-124,126-134,139-159, 173-203 are non-elected.

*** The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

***Claim Rejections - 35 USC § 103***

1. Claims 41,43-44,46,56-61,103-102,111-112,125,166-167,169-172 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiho et al (2003/0045632) taken with Jacobson et al (both 6,294,401 and 6,200,508) and Beppu et al (5,866,471).

Shiho teaches (at paragraphs 38-93) a method for making a semiconductor film comprising at least the steps of: a) inkjet printing, offset printing , screen printing (paragraphs 110,153,54-64,162-167) a solution composition comprising passivated semiconductor nanoparticles, a first cyclic Group IVA compound of the formula $Si_nR_m$, n is an integer of 3 or more and m is integer of 2n+2, wherein $Si_nH_{2n+2}$ (n is of 2 to 8), or $Si_iH_{2j}$ (j is of 2 to 8) or $Si_kH_k$ (k is 6,8, or 10) are mentioned at paragraphs 18,44, and a solvent (paragraphs 0102-0103,153) in a film/pattern on a substrate, wherein it may be patterned by the application of the liquid material and patterning may be carried out at the same time by an ink jet method; and b) curing said printed solution composition film/pattern to form said semiconductor film (paragraphs 117,120,137,138), wherein curing the printed pattern comprises irradiating the printed composition (paragraphs 138,113,137,120,153). Re claims 42-44, wherein the composition comprises semiconductor silicon nanoparticles (paragraphs 60-64) and passivated as the silicon particles are dispersed in the silane composition. Re claims 111-112, wherein the composition including both first and second cyclic group IVA compound of silicon and dopants of B, P, As (at paragraphs 38-93), herein $Si_nH_{2n+2}$ is mentioned at paragraph 44, wherein dopants of B, P, and As with at least alkyl group are mentioned at paragraphs 76-82. Re claims 46,58,169 wherein curing by heating so as to sintering the semiconductor film so as to dry the semiconductor film (paragraphs 117,120,137-138), wherein curing comprises irradiating the composition (paragraphs 120,138). Re claims 58-59,169-172, 125, wherein curing by heating so

as to sintering the semiconductor film so as to dry the semiconductor film at a temperature at least about 200°C (paragraphs 117,120,137-138), wherein sintering temperature is at least about 300°C (paragraphs 117,120,137-138). Re claims 60-61, wherein the curing heat treatment is evacuated so as to treat in an inert argon gas or reducing hydrogen gas in chamber, inherently (paragraphs 117, 137). Re claim 165, wherein the formula is $Si_nR_m$, n is an integer of 3 or more and m is integer of 2n+2, wherein $Si_nH_{2n+2}$ (n is of 2 to 8), or $Si_jH_{2j}$ (j is of 2 to 8) or $Si_kH_k$ (k is 6,8, or 10) are mentioned at paragraphs 18,44, wherein dopants of B, P, and As with at least alkyl group are mentioned at paragraphs 76-82, which is corresponding to claimed formula (1):(AHx )n, where n is from 3 to 8 and each A in the formula is independently Si, and/or a second cyclic Group IVA compound of the formula (2):(AHx)m(AHyRzy)p(ZR')q, (2) where (m+p+q) is from 3 to 12, each of the m instances of x is independently 0, 1 or 2, each of the p instances of y is independently 0, 1 or 2, each of the p instances of z is independently 0, 1 or 2, each of the p instances of (y+z) is independently 1 or 2, each of the q instances of w is independently 0 or 1, at least one of p and q is at least 1, each A in the formula (2) is independently Si, Z is selected from the group consisting of B, P and As, R' is R or H, and each R in the formula (2) is independently alkyl, aryl, aralkyl, a halogen, BHsR"2s, PHsR"2-s, AsHR"2-s or AHtR".sub.3-t, where s is 0 to 2, t is 0 to 3, and R" is alkyl, aryl, aralkyl, a halogen, or AH3,

Re claims 41,166, Shiho already teaches inkjet printing a semiconductor film having a thickness, but lacks forming the semiconductor film as a patterned semiconductor film from a solution, and by gravure printing; and re further claim 166, wherein cyclogermane or cyclosilagermane is employed.

However, Jacobson '401 teaches (at col 5, lines 34-60; col 3, lines 36-65; col 4, lines 32-64) printing passivated semiconductor nanoparticles to form a patterned semiconductor film on a substrate by using any of variety including spin coating, casting, screen printing, stamping, etc, wherein the patterned semiconductor film is used in forming a thin film transistor, wherein printing is performed by ink jetting the solution composition comprising a solvent and the passivated semiconductor nanoparticles onto the substrate to form a pattern (re further claim 56, col 5, lines 34-45, col 6, lines 1-10; col 4, lines 13-15; Fig 4, col 7, lines 10-20), wherein ink-jet system is configured to deliver a selected of a series of solution, colloids, and/or dispersion of

one or more materials, wherein the nanoparticles may be passivated at the surface by an organic capping group which is largely determined the solubility of the particles (col 4, lines 48-64), wherein by employing a screen printing process, the composition solution with the nanoparticles and the solvent is inherently deposited on the substrate through stencil on or over the substrate, and wherein the printing of the composition with solvent includes screen printing, gravure printing, lithography (re claim 57). Jacobson '508 also teaches (at Figures 1A-1C; col 2, line 31 through col 3) making a patterned semiconductor film by ink jet printing a pattern on a substrate, and curing the pattern to form the patterned semiconductor film by ink jet printing an ink having a composition solution comprising semiconductor particles having semiconductor properties such as silicon and a solvent, wherein the semiconductors may be dispersed or dissolved in an appropriate solvent. Beppu et al teach (at col 5, line 16 to col 7; col 6, lines 29-35; col 5, lines 30-35; col 7, lines 35-67, re claim 166) forming a semiconductor film by employing a semiconductor material including silicon and/or germanium, and employing a cyclic polysilane or polygermanium (cylogermane for germanium or cyclosilagermane for silicion and germanium).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the semiconductor film of Shiho as a patterned semiconductor film by inkjet printing, Gravure printing, offset printing, screen printing, and spin coating a solution composition comprising passivated semiconductor nanoparticles and a solvent onto a substrate to form a pattern, as taught by Jacobson (both '401 and '508), and Shiho above, wherein by employing the ink jet printing method for forming the pattern, the passivated semiconductor nanoparticles can be dissolved/soluble or dispersed in the solvent as further taught by Jacobson (both '401 and '508), wherein forming the semiconductor film by employing silicon and/or germanium is taught by Beppu et al. This is because of the desirability to employ the ink-jet printing method or other printing processes for directly forming a plurality of patterned semiconductor films of silicon and/or germanium of a plurality of semiconductor thin film transistors, on desired and selected portions of the substrate without performing a photolithographic process for patterning, wherein by employing the ink-jetting method for depositing a pattern line, using a solution comprising passivated semiconductor nanoparticles dissolved/soluble in the solvent would effectively reduce and prevent clogging of the ink-jet

nozzles (a commonly known problem in the ink-jet printing method). Moreover, it would have been obvious because a person of ordinary skill in the art would have been motivated to combine the prior art to achieve the claimed invention and that there would have been a reasonable expectation of success when employing a composition solution in the ink jet printing method, and because "a person of ordinary skill has a good reason to pursue the known options within his or her technical grasp. If this lead to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense" for forming a plurality of semiconductor patterns on a substrate, and because ink jet printing method is a particular known technique was recognized as part of the ordinary capabilities. In re Supreme Court Decision in KSR International Co. v. Teleflex Inc. 82 USPQ2d, 1385 (2007). This is because of the desirability to form an array of lines of patterned semiconductor films having a desired dimensions on the substrate, and for used in manufacturing a plurality of semiconductor device. The subject matter as a whole would have been obvious to one or ordinary skill in the art at the time the invention was made to select the portion of the prior art's range of value for.x and n in the formula, and prior art's range of temperature, as taught by Shiho, both Jacobson, and Beppu, which is within the range of applicant's claims, because it has been held to be obvious to select a value in a known range by optimization for the best results, and would be an unpatentable modification, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation". *In Re Aller* 104 USPQ 233,255 (CCPA 1955); *In re Waite* 77 USPQ 586 (CCPA 1948); *In Re Swanson* 56 USPQ 372 (CCPA 1942); *In Re Sola* 25 USPQ 433 (CCPA 1935); and *In Re Dreyfus* 24 USPQ 52 (CCPA 1934).

2. Claims 51,53-54,168,204-205 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiho et al (2003/0045632), Jacobson et al (both 6,294,401 and 6,200,508) and Beppu et al (5,866,471), as applied to claims 41,43-44,46,56-61,103-102,111-112,125,166-167,169-172 above, and further of Tani et al (5,254,439).

The references including Shiho, Jacobson, and Beppu teach a method for making a semiconductor film as applied to claims 41,43-44,46,56-61,103-102,111-112,125,166-167,169-172 above. Jacobson '401 teaches (at col 5, lines 34-60; col 3, lines 36-43) printing a

composition of semiconductor nanoparticles to form a patterned semiconductor film on a substrate by using any of variety including spin coating, casting, screen printing, stamping, wherein the printing of the composition with solvent includes screen printing, gravure printing, lithography. Jacobson '508 teaches (at Figures 1A-1C; col 2, line 31 through col 3) making a patterned semiconductor film by ink jet printing a pattern on a substrate, and curing the pattern to form the patterned semiconductor film by ink jet printing an ink through a patterned aperture mask 21. Beppu et al teach (at col 5, line 16 to col 7; col 6, lines 29-35; col 5, lines 30-35; col 7, lines 35-67) forming a semiconductor film by employing a semiconductor material including silicon and/or germanium, and employing a cyclic polysilane or polygermanium (cylogermane for germanium or cyclosilagermane for silicion and germanium). Shiho also teaches (at paragraph 110) depositing the composition by inkjet printing, spray coating, spin coating, and irradiating the composition with an ultraviolet light (paragraph 138).

Shiho thus lacks selectively irradiating the composition through a mask (claims 51-54) before curing (204-205).

However, Tani teaches (at Figs 2,3; col 5, line 60 through col 6) selectively irradiating the layer through a mask aligned on substrate as marked, and removing a portion of the layer after irradiating in order to form a plurality of patterned layers.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to pattern the semiconductor film of the references including Shiho and Jacobson (both) by selectively irradiating through a mask and removing a portion of the layer as taught by Tani before curing the semiconductor film of Shibo. This is because these patterning techniques are alternative and art recognized equivalent for substitution in forming distinct patterned semiconductor films on the substrate so as a plurality of semiconductor thin film transistors can be fabricated at the same time.

3. Claims 62-65,160-164 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiho et al (2003/0045632), Jacobson et al (both 6,294,401 and 6,200,508), and Beppu et al (5,866,471) , as applied to claims 41,43-44,46,56-61,103-102,111-112,125,166-167,169-172, above, and further of Kim et al (6,355,198).

The references including Shiho, both Jacobson, and Beppu teach a method for making a semiconductor film as applied to claims 41,43-44,46,56-61,103-102,111-112,125,166-167,169-172, above.

Shiho already teaches inkjet printing a semiconductor film having a thickness, particularly preferably of 0.01 to 5μm (paragraph 0110), while claims 62-65 and 160-164 recite an array of lines having a width of from 50nm to 50μm, a length of from 2 to 2000μm , and a thickness of from 0.01 to 500 μm.

However, Kim teaches (at Figs 1,15,16; col 34, lines 13-50) printing and curing a composition to form an array of lines having a typical width of from 1μm to 10μm, a length of from 100μm , and a thickness as similar to a width and spacing of from 1μm to 10μm.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the semiconductor film of Shiho as an array of lines of a patterned semiconductor film having a typical width of from 1μm to 10μm, a length of from 100μm , and a thickness as similar to a width of from 1μm to 10μm by inkjet printing, gravure printing, offset printing, as taught by Kim and Shiho above. This is because of the desirability to form an array of lines of patterned semiconductor films having a desired dimensions on the substrate, and for used in manufacturing a plurality of semiconductor device. The subject matter as a whole would have been obvious to one or ordinary skill in the art at the time the invention was made to select the portion of the prior art's range of thickness, as taught by Kim and Shiho, which is within the range of applicant's claims, because it has been held to be obvious to select a value in a known range by optimization for the best results, and would be an unpatentable modification, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation". *In Re Aller* 104 USPQ 233,255 (CCPA 1955); *In re Waite* 77 USPQ 586 (CCPA 1948); *In Re Swanson* 56 USPQ 372 (CCPA 1942); *In Re Sola* 25 USPQ 433 (CCPA 1935); and *In Re Dreyfus* 24 USPQ 52 (CCPA 1934).

4. Claims 135-138 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiho et al (2003/0045632), Jacobson et al (both 6,294,401 and 6,200,508) and Beppu et al (5,866,471),

as applied to claims 41,43-44,46,56-61,103-102,111-112,125,166-167,169-172 above, and further of Korgel (2003/0034486) .

The references including Shiho, both Jacobson, and Beppu teach a method for making a semiconductor film as applied to claims 41,43-44,46,56-61,103-102,111-112,125,166-167,169-172, above.

Shiho already teaches (at paragraphs 0061-0062) forming silicon particles having a diameter of from 0.005 micron (5 nm as 1 micron equals to 1000nm), while claims 135-138 recites silicon particles having an average diameter of less than 5 nm or 3.5 nm.

However, Korgel teaches (at col 15, lines 12-30) forming silicon particles comprising nano-particles having an average diameter of about 5 nm, 3.5 nm, or 2 nm.

The subject matter as a whole would have been obvious to one or ordinary skill in the art at the time the invention was made to select the portion of the prior art's range of average diameter of silicon particles, as taught by Korgel, which is within the range of applicant's claims, because of the desirability to form silicon nanoparticles for forming very small devices, and because it has been held to be obvious to select a value in a known range by optimization for the best results, and would be an unpatentable modification, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation". *In Re Aller* 104 USPQ 233,255 (CCPA 1955); *In re Waite* 77 USPQ 586 (CCPA 1948); *In Re Swanson* 56 USPQ 372 (CCPA 1942); *In Re Sola* 25 USPQ 433 (CCPA 1935); and *In Re Dreyfus* 24 USPQ 52 (CCPA 1934).

***Election/Restrictions***

*** As of record, Claims 96-110,113-124,126-134,139-159 are withdrawn from consideration as being directed to a non-elected invention, see 37 CFR 1.142(b). Newly submitted claims 173-203 are drawn to subject matter similar to that of non-elected claims 96-110,113-124,126-134,139-159, and accordingly be grouped into the non-elected group. Since applicant has received an action on the merits for the originally presented invention of subject matter of claim 41 as generic claim, claims 96-110,113-124,126-134,139-159, 173-203 have been constructively elected by original presentation and examination for prosecution on the merits.

Independent claim 41 is a generic claim, and being currently considered and examined with elected group. Thus, upon the allowance of a generic claim, applicant will be entitled to consideration of claims to *additional species which are written in dependent form or otherwise include all the limitations of an allowed generic claim as provided by 37 CFR 1.141.* If claims are added after the election, applicant must indicate which are readable upon the elected species. MPEP § 809.02(a).

***Response to Amendment***

5. Regarding prior arts:

Applicant's remarks filed January 23, 2008 with respect to pending claims have been considered but are moot in view of the new ground(s) of rejection.

Applicant remarked that "...Shiho is silent with regard to making a patterned semiconducting film by gravure printing or flexographic printing..."

In response, this is noted and found unconvincing. At least the references of Jacobson '401 clearly teaches (at col 5, lines 34-60; col 3, lines 36-65; col 4, lines 32-64) forming the patterned semiconductor film by printing passivated semiconductor nanoparticles to form a patterned semiconductor film on a substrate by using many printing techniques including ink jetting the solution composition, screen printing, gravure printing, lithography, etc..

Applicant remarked (at remark page 21+) that "...Shiho is silent with regard to...cyclogermane or cyclosilagermane...".

In response, this is noted and found unconvincing. First, claim 41 does not require of cyclogermane or cyclosilagermane. Claimed subject matter, not the specification, is the measure of invention. Limitations in the specification cannot be read into the claims for the purpose of avoiding the prior art. In Re Self, 213 USPQ 1,5 (CCPA 1982); In Re Priest, 199 USPQ 11,15 (CCPA 1978). Second, the second reference of Beppu clearly teaches (at col 5, line 16 to col 7; col 6, lines 29-35; col 5, lines 30-35; col 7, lines 35-67) forming a semiconductor film by employing a semiconductor material including silicon and/or germanium, and employing a cyclic polysilane or polygermanium (as the cylogermane for germanium or cyclosilagermane for silicion and germanium). It is well settled that one can not show non-obviousness by attacking the references individually where, as here, the rejection is based on

however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

**********

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael M. Trinh whose telephone number is (571) 272-1847. The examiner can normally be reached on M-F: 9:00 Am to 5:30 Pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra Smith can be reached on (571) 272-2429. The central fax phone number is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).
Oacs-21

/Michael Trinh/

Primary Examiner, Art Unit 2822